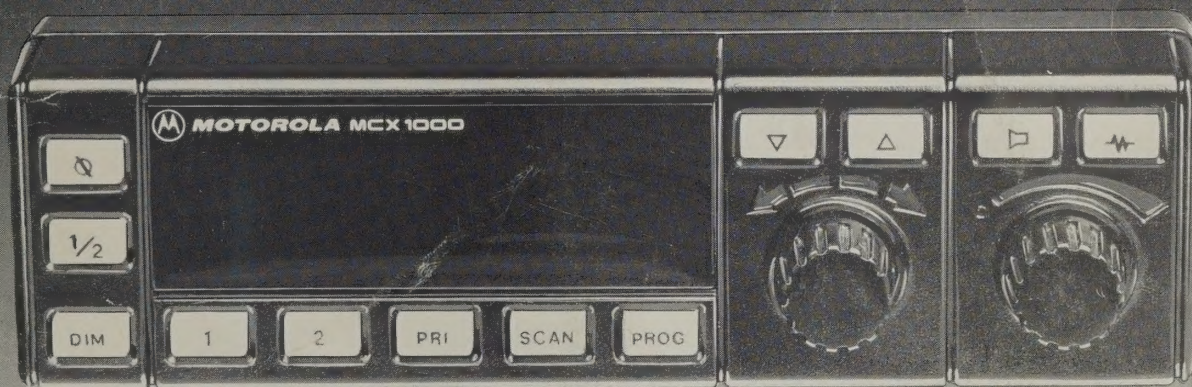




**MOTOROLA LIMITED**

Communications Division

**SECURENET™**  
**DIGITAL VOICE ENCRYPTION**  
**MCX1000™**  
**TWO-WAY FM RADIO**



Supplement to Service Manuals 68P02902A56,  
68P02902A57, 68P02902A38 & 68P08900A20

**Service Manual Supplement**

68P02902A19  
Issue B



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## **SERVICE MANUAL ORDERING INFORMATION**

Further copies of this manual may be purchased by contacting either your local Motorola Service Representative or the nearest Motorola Area Parts Office. Area Parts Office addresses are located on page v/vi.



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**Communications Division**

# **GENERAL SAFETY INFORMATION**

---

Proper use of this radio requires that the following precautions be taken:

DO NOT operate the transmitter of a mobile radio when someone outside the vehicle is within 0.6 metres (two feet) of the antenna.

DO NOT operate the transmitter of a fixed radio (base station, microwave and rural telephone rf equipment) or marine radio when someone is within 0.6 metres (two feet) of the antenna.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

In addition,

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.

All equipment must be properly grounded according to Motorola installation instructions for safe operation.

All equipment should be serviced only by a qualified technician.

---

## **WARNING**

### **ELECTRONIC ANTI-SKID BRAKING SYSTEMS**

For vehicles equipped with electronic anti-skid braking systems, see "ANTI-SKID BRAKING PRECAUTIONS" Publication, Motorola Number 68P81109E34.

---

## **WARNING**

### **VEHICLES FUELED BY LIQUEFIED PETROLEUM GAS**

It is mandatory that radio installations in vehicles fueled by liquefied petroleum gas conform to the standards of the country in which the radio is operated.

---



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## WARNING

### RESTRICTED USE OF GLASS-MOUNT ANTENNAS

Non-Metallic Vehicles - DO NOT install any glass-mount antenna on fiberglass or other non-metallic vehicles in mobile systems with transmit output power in excess of seven (7) watts because such installations may result in the exposure of the vehicle occupants to excessive radio frequency energy levels.

Metal Body Vehicles - In metal body vehicles, it is mandatory that the Motorola supplied glass-mount antenna installation instructions covering location of the antenna at the top of the front or rear window and cable routing be followed **exactly as described** to ensure that vehicle occupants are not exposed to excessive radio frequency energy levels.

If installations of this type have already taken place, notify your local Motorola Service Representative immediately so that appropriate corrective action can be taken.

---

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## WARNING

### UNSAFE USE OF CONVERTED MOBILE EQUIPMENT FOR PORTABLE APPLICATIONS

Motorola two-way radio products which have been designed for mobile operation **should not** be used as battery operated portable units. In such use there is the danger that the user or other persons will be exposed to excessive radio frequency energy levels. This warning applies to all two-way radio equipment radiating in excess of seven (7) watts rf power. Motorola strongly recommends that any product which converts high power equipment for portable operation **not be used**.

---

## NOTE

In mobile installations, consider the occupants' safety when choosing a location for the radio. Do not mount the radio overhead or on a sidewall unless special precautions are taken. Otherwise the radio could become unfastened in an automobile accident and injure the occupants.

---

Refer to the appropriate sections of this product service manual for additional pertinent safety information.

---

# SERVICE

Motorola's National Service Organization offers a nation-wide installation and maintenance program for communications equipment users. This organization includes hundreds of authorized Motorola Service Stations (MSS) located throughout the United States and Canada, each manned by one or more trained and licensed technicians.

Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola

Service Representative, or write :

- in the United States

National Service Manager  
Motorola Communications and Electronics, Inc.  
1303 E. Algonquin Road  
Schaumburg, Illinois 60196

- in Canada

National Service Manager  
Motorola Limited  
3125 Steeles Avenue East  
North York, Ontario  
M2H 2H6





# REPLACEMENT PARTS ORDERING

## ORDERING INFORMATION

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Crystal and channel element orders should specify the crystal or channel element type

number, crystal and carrier frequency, and the model number in which the part is used.

Orders for active filters, Vibrasender and Vibrasponder resonant reeds should specify type number and frequency, should identify the owner/operator of the communications system in which these items are to be used; and should include any serial numbers stamped on the components being replaced.

## MAIL ORDERS

Send written orders to the following addresses:

Replacement Parts/  
Test equipment/  
Crystal Service Items:  
Motorola Inc.

Communications Parts Division  
Attention: Order Processing  
1313 E. Algonquin Road  
Schaumburg, IL 60196

Federal Government Orders:

Motorola Inc.  
Communications Parts Division  
Attention: Order Processing  
1701 McCormick Drive  
Landover, MD 20785

International Orders: (except Canada)

Motorola Inc.  
Communications Parts Division  
Att: International Order Processing  
1313 E. Algonquin Road  
Schaumburg, IL 60196

All Canadian Orders:

Motorola Ltd.  
National Parts Department  
3125 Steeles Ave. East  
North York, Ontario  
M2H 2H6

## TELEPHONE ORDERS

Replacement Parts/Test Equipment,  
Call: 1-800-422-4210  
1-800-826-1913 (for Federal  
Government Orders)

Crystal Service Items,  
Call: 1-800-422-4210  
All Canadian Orders,  
Call: 416-499-1441

## NATIONAL DATA SERVICES

1711 West 17th Street  
Tempe, AZ 85281  
Call: 602-994-6472  
TWX: 910-951-1334

## TELEX/FAX ORDERS

Replacement Parts/Test  
Equipment/Crystal Service Items:  
Telex: 280127  
FAX: 312-576-6285

Federal Government Orders:  
FAX: 301-925-2473  
or 301-925-2474

All Canadian Orders:  
Telex: 06-526258  
TWX: 610-491-1032

## CUSTOMER SERVICE

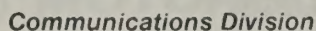
Replacement Parts/Test Equipment,  
Call: 1-800-537-7007

Parts Identification,  
Call: 312-576-7418

Crystals, Call: 1-800-323-0234  
(except Illinois Residents)  
1-800-537-7007  
(for Illinois Residents)







**SECURENET™**  
DIGITAL VOICE ENCRYPTION  
**MCX1000™**  
TWO-WAY FM RADIO

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# PART 1. INTRODUCTION

## 1.1 GENERAL

This manual supplement is intended to be used in conjunction with either the VHF or UHF MCX1000 Radio service manuals described in Section 1.3. It provides information specific to the two printed circuit boards which provide the voice encryption function.

While the MCX1000 Radio is available in both digital and non-digital versions, only the digital version of the MCX1000 supports the digital voice encryption options.

The digital MCX1000 Radio with voice encryption is similar both mechanically and electrically to the digital MCX1000 Radio without encryption. The mechanical and electrical differences are described in Section 2 of this manual.

## 1.2 RADIO OPERATION WITH VOICE ENCRYPTION

Refer to the MCX1000 Radio Service Manual for instructions on transmitting with a voice encrypted radio.

All switching necessary to receive an encrypted signal is performed automatically by the radio. If the radio receives an encrypted signal, the Coded Signal Receive Indicator turns on. This indicator is located to the right of the display and above the Code 2 Select Indicator (see Figure 1-1).

## 1.3 RELATED DOCUMENTS

This manual is a supplement to the manuals listed here.

- MCX1000 Two-Way FM Radio VHF Service Manual (68P02902A56)

- MCX1000 Two-Way FM Radio UHF Service Manual (68P02902A57)
- PACS MCX1000 Radio VHF Service Manual (68P08900A20)
- Marine MCX1000 Two-Way FM Radio VHF Service Manual (68P08900A38)

The information discussed in this supplement is applicable to the manuals mentioned above. Any reference made in this supplement to "MCX1000 Radio Service Manual" applies to these manuals.

## 1.4 DESCRIPTION OF ENCRYPTION OPTIONS

A listing of all options that relate to voice encryption may be found in Section 2 of the MCX1000 Radio Service Manual under the heading "Options Unique to Digital Capable Radios".

## 1.5 ENCRYPTION RELATED KITS

Listed below are kit contents for kits related to voice encryption of the MCX1000 Radio. The kits used depend on the radio model and the encryption scheme. This information is specified in the supplement supplied with the encryption hardware. Kits used in security housing applications are detailed in Section 5.

VLN4128A Extension Hardware

0310943J10	SCR TPG TT3X0.5X8 INTSTARPAN (6)
1584663N02	CHASSIS EXTN CASTING

**VLN4129A Keyload Connector Assembly**

0980263D01 5 PIN MALE CONN.  
0984279D03 CRIMP CONN. (5)  
1484277D17 CONN. HOUSING  
1584663N01 CHASSIS EXTN  
CASTING

1584221N01 PA COVER  
1584288N01 BOTTOM COVER  
7582200H03 PAD (2 used)

**VLN5118B Option Interconnect Board**

See Parts List in Section 4 of this manual.

**VLN4130A Top Cover**

1482125N02 FRONT PANEL INS.  
1484173M02 TOP COVER INS.  
1584289N01 TOP COVER  
7582200H01 PAD  
7582200H03 PAD

**VLN4756C Securenet Option Board  
(QVLN4939C for Marine radio)**

See Parts List in Section 4 of this manual.

**VLN4131A VHF Bottom Cover**

1584288N01 BOTTOM COVER  
7582200H03 PAD (2 used)

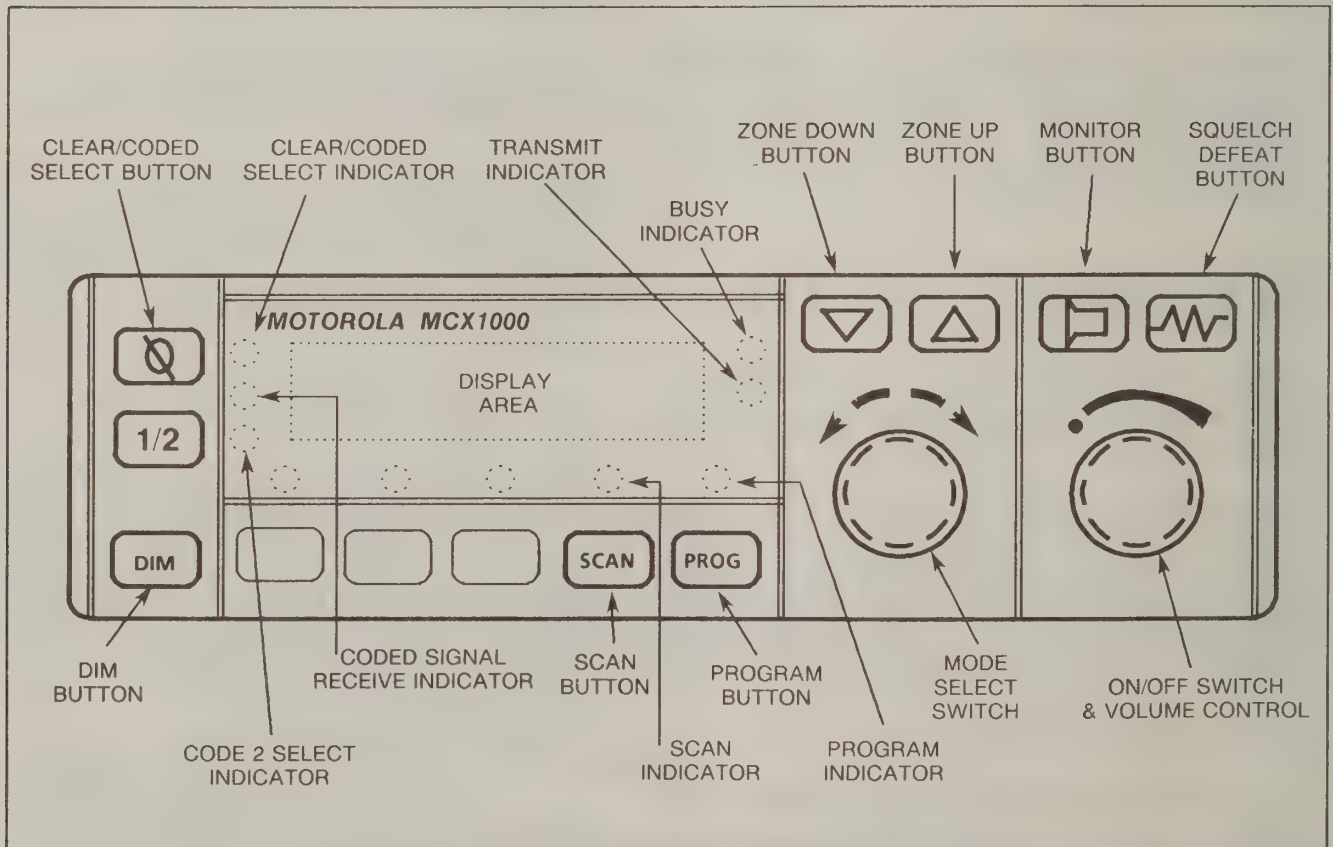
**VLN4855A Dual Code Select Button**

3800026M07 BUTTON

**VLN4286A UHF Bottom Cover (used for VHF  
field installations also)**

**VLN4861A Clear/Coded Select Button**

3800026M14 BUTTON



*Figure 1-1 MCX1000 Radio - Typical Controls and Indicators*





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## **SECTION 2. MECHANICAL AND ELECTRICAL CHARACTERISTICS**

---

### **2.1 MECHANICAL DESCRIPTION OF THE VOICE ENCRYPTED MCX1000 RADIO**

The mechanical description of the digital radio may be found in the MCX1000 Radio Service Manual.

The digital MCX1000 Radio with voice encryption differs mechanically from a digital radio without encryption by the addition of two printed circuit boards (the Option Interconnect Board and the Securenet Option Board). A mechanical extension is made to the front of both the front mount and remote mount radios to accommodate these two new boards. See Figure 2-1 for the positions of the voice encryption boards

The digital radio with voice encryption also differs electrically from the digital radio without encryption. In the non-encrypted dash mount radio, the Front Panel Interconnect Board is directly plugged into the Dash Mount Control Head Microcomputer Board. In the voice encrypted version of the radio, the Option Interconnect Board is placed between the two boards mentioned above. This Option Interconnect Board provides the necessary connectors to accept

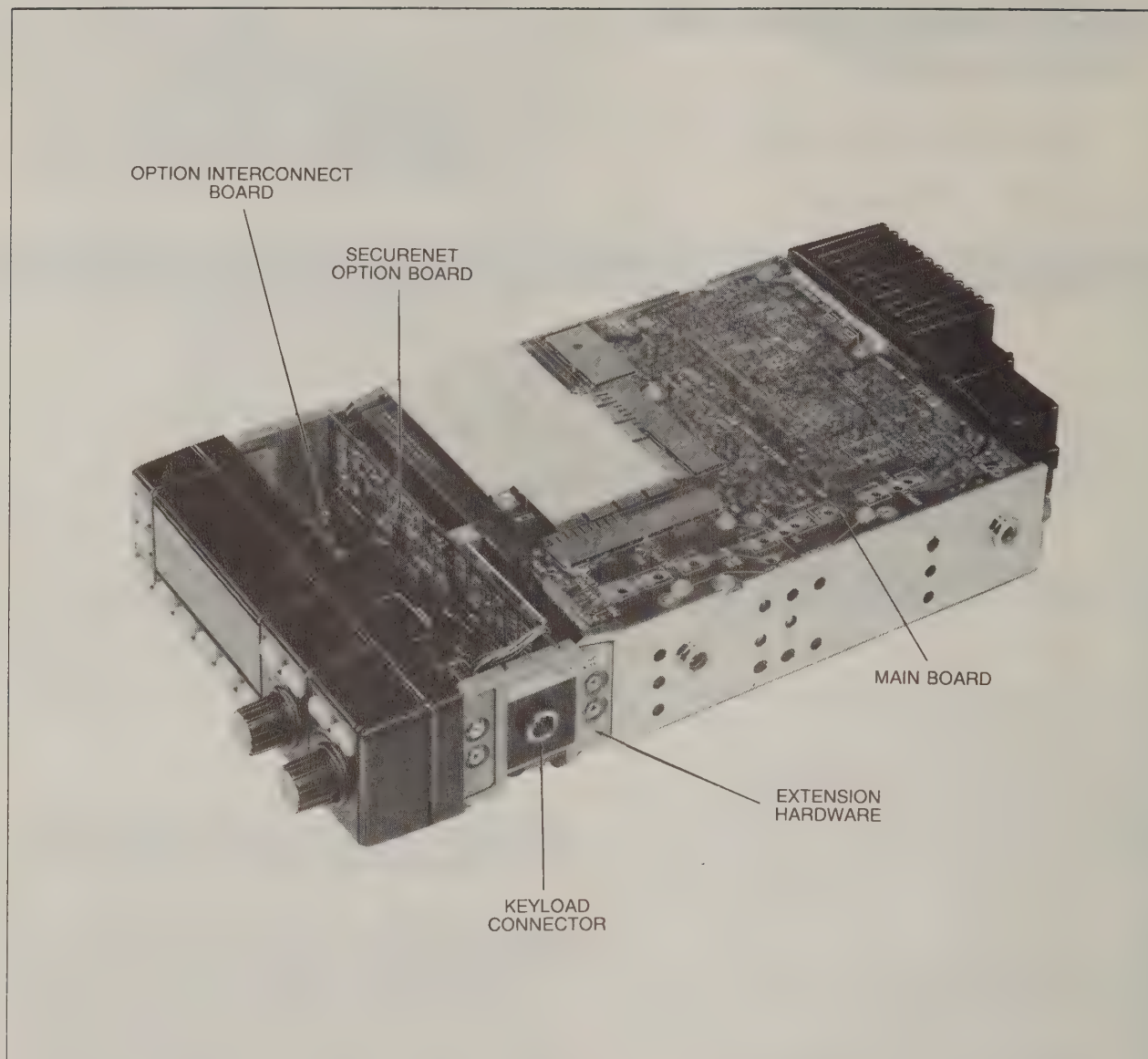
another board called the Securenet Option Board.

In the non-encrypted remote mount radio, the Front Panel Interconnect Board is directly plugged into the Remote Interface Board. In the voice encrypted version of the radio, the Option Interconnect Board is placed between the two boards mentioned above. Again, the Option Interconnect Board provides the necessary connectors to accept another board called the Securenet Option Board.

### **2.2 ELECTRICAL DESCRIPTION OF THE VOICE ENCRYPTED MCX1000 RADIO**

The voice encrypted MCX1000 Radio is similar electrically to the digital radio without encryption. An electrical description of the non-encrypted radio may be found in the MCX1000 Radio service manual. The theory of operation for particular boards is found at the beginning of the sections pertaining to those boards.

The electrical descriptions of the two new boards (Option Interconnect Board and Securenet Option Board) are found in Section 3 of this manual entitled Theory of Operation.



*Figure 2-1 Position of Voice Encryption Boards*





## SECTION 3.

# THEORY OF OPERATION

---

### 3.1 THEORY OF OPERATION - GENERAL DESCRIPTION

The voice encryption circuits interact with a number of other radio circuits. A description of the characteristics of the various boards in the non-encrypted MCX1000 Radio may be found in the MCX1000 Radio service manual by referring to the appropriate sections. Following is a description of the voice encryption circuits. Figure 3-1, Securenet Block Diagram, located at the end of this section, supports the discussion below.

The voice encryption circuitry interfaces with the radio audio circuits to add a high security scrambled voice mode. Microphone audio is digitized, transformed into cipher, and applied to the transmitter circuits. Similarly, received cipher is transformed into audio and applied to the speaker. Logic circuits and audio switches allow operation in either the private (coded) mode or the standard (clear) mode.

The private mode employs a digital non-linear coding scheme. Microphone audio is digitized by a Continuously Variable Slope Delta modulator (CVSD) whose output is applied to a non-linear digital encryption circuit. The encrypted data is then filtered and used to modulate the synthesizer. In the receive mode, cipher from the discriminator is applied to a decoder whose digital output is converted to an analog signal by the CVSD.

A filter shapes the received audio before it is applied to the speaker amplifier circuit.

All Motorola encryption system components (base stations, mobiles, and portables) utilize a self synchronizing non-linear digital voice scrambling scheme with an extremely large capacity of

unique orthogonal codes. Once loaded, the chosen code is internally stored and completely unreadable. A single electronic key inserter (with appropriate interconnect cable) allows easy code insertion on any desired schedule. Selection of either private or standard transmissions may be made at the front panel by the operator.

Additional features included to ensure operator convenience and flexibility are:

- fully automatic selection and front panel indication of private receive mode
- audible alert to remind the operator when he is initiating a non-encrypted transmission

Options associated with voice encryption are available to expand the performance of the MCX1000 Radio. These are listed below.

#### Dual Code Select

- provides a second key selection capability (availability restricted to a specific encryption type).

#### Proper Code Detect

- enables the radio to remain muted unless the proper encryption code is received.

#### Security Housing

- described in Section 5. of this manual.

#### Code Storage Battery

- provides a memory retention battery to enable code key retention in the event that radio power is removed. This option is described in Section 3.2 of this manual under the heading Option Interconnect Board.

## 3.2 THEORY OF OPERATION-FUNCTIONAL DESCRIPTION

### Voice Encryption Definitions

Figure 3-2 below contains the definitions of terms used in the explanation of voice encryption operation and circuitry.

TERM	DEFINITION
Alert Tone	Sounded at the speaker when the operator transmits in the standard mode. The tone alerts the operator that the transmission is not encrypted. The alert consists of a 800 Hz. tone for about 80 milliseconds.
Cipher Text	Refers to the digital waveform which represents the encrypted audio.
Code	The word sometimes used in place of the correct term which is key (see key).
Code Inserter	An electronic device used to load an electronic encryption key into encryption capable radios.
Code Storage Battery	(Option MBB268) Allows the SECURENET encryption IC to retain the code if the power supply red lead to the radio is disconnected.
Crossover Jitter	The ratio of crossover time (X) to whole bit time (T). See Figure 3-3. For example, with X equal to 0.55 cm and T equal to 3.5 cm, the crossover jitter is 15.7%.
CVSD	Continuously Variable Slope Delta. The continuously variable slope delta modulator is the IC U6102 on the Securenets Option Board schematic diagram. Its function is to convert the digital signal to an audio signal in receive mode and convert the audio signal to a digital signal in transmit mode.
Decryption	The conversion of cipher text to plain text.
Dual Code	A second key capability. The key is stored in the Code 1 position. The Code 2 position electronically alters the stored key. An operator control selects either Code 1 or Code 2.

*Figure 3-2 Voice Encryption Term Definitions (Sheet 1 of 3)*



TERM	DEFINITION
Encrypted Voice Communication	Called private mode, secure mode, cipher, or cipher text depending on the context in which the term is used. In this mode, the audio signal is converted to a digital signal and encrypted before transmission. At the receiver, the receiver signal is decrypted, and the resulting digital signal is used to reconstruct the audio waveform.
Encryption	The conversion of plain text to cipher text.
End-Of-Message (EOM)	A short burst signal of 6 kHz sine wave transmitted at the end of a private mode message by a voice encrypted radio. EOM lasts for the interval usually used for the PL reverse burst signal which is about 180 milliseconds. The EOM signal functions as a squelch closure.
Eye Opening	The ratio of the minimum sample value to the overall eye amplitude expressed as a percentage. See Figure 3-3. For example, with Y equal to 1.0 cm and Z equal to 2.5 cm, the eye opening is 40.0%.
Eye Pattern	A visual representation of transmit cipher text converted by the splatter filter. See Figure 3-3. The term eye pattern is used because the oscilloscope trace vaguely resembles the shape of the human eye.
Idle Pattern	The Signal generated by the CVSD modulator when no sound is entering the microphone. This signal is a 6-kHz square wave.
Key	Consists of a sequence of bits that are electronically stored in the encryption module. The key is sometimes referred to as the electronic key to distinguish it from a physical key such as a car key. The key is sometimes casually referred to as a code.
Plain Text	Refers to the digital waveform which represents the non-encrypted audio or decrypted audio.
Quality Of Received Signal	Expressed by an error rate or probability of error. This number expresses the probability that any bit that is recovered by the receiver is in error. The error rate measures the quality of a private mode signal in much the same way that quieting or SINAD measure the quality of a standard mode signal. For voice encrypted radios, the error rate is usually measured for plain text rather than cipher text since it is easier to measure. For plain text messages to be intelligible in the voice encrypted MCX1000, the error rate should be less than 5%.

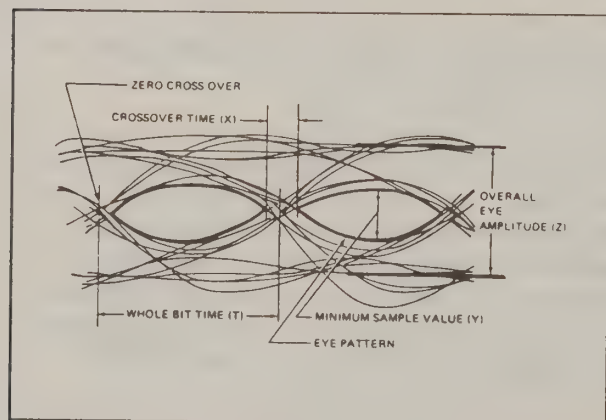
*Figure 3-2 Voice Encryption Term Definitions (Sheet 2 of 3)*

TERM	DEFINITION
Splatter Filter	Converts the transmit cipher text signal to an eye pattern signal.
Standard Voice Communication	Also called standard mode, clear mode, bypass mode, or plain text depending on the context in which the term is used. In this mode of operation, the audio signal is transmitted exactly like an FM two-way radio normally transmits an audio signal.
Turn-Off-Code (TOC)	The term sometimes used instead of end-of message (EOM).
Zero Crossover	Corresponds to the transition point between bits. See Figure 3-3.

*Figure 3-2 Voice Encryption Term Definitions (Sheet 3 of 3)*

## General

The voice encryption circuitry is contained on two boards located within the radio housing just behind the front panel circuitry as described in Section 2.1 of this manual. The boards use CMOS integrated circuits to perform the audio switching and control functions which are necessary to control the MCX1000 radio. A five pin connector at the side of the radio allows loading of an electronic encryption key into the voice encryption circuitry. Switches and indicators necessary to control the voice encryption circuitry are conveniently located on the radio front panel.



*Figure 3-3 Cipher Text Waveform*

## Option Interconnect Board

Most of the voice encryption circuitry is contained on the Securenet Option Board. However, the Option Interconnect Board provides the functions described below.

- Battery BT6000 (see Figure 4-3 for part number) which supplies continuous voltage to encryption hybrid U6103 (U6103-3) on the Securenet Option Board to retain the code key if radio power is removed. This battery is shown in Figure 4-1 (component side) and Figure 4-2 (schematic).
- U6002B amplifier circuit receives RX BUS AUDIO from the Securenet Option Board, amplifies it and sends it through the Front Panel Interconnect Board (as RX OPTION SUMMER), through the Analog Interface Board and further on to audio circuits on the Main Board.
- U6001, U6003 and associated circuitry constitutes a series of cascaded amplifiers and band-limiting filters which pass microphone audio (MIC AUDIO) from J366A-6 to the Securenet Option Board via P6003-3. The primary signal gain occurs in the first stage (U6001A).



- U6000A amplifies discriminator audio (DISC AUDIO) from J366A-17 and sends it to the Securenet Option Board as AMP DISC AUDIO via P6002/P6003-4.

## Voice Encrypted Signal Routing

In the discussion following, reference is made to Figure 3-1 (Securenet Block Diagram) and Figure 4-5 (Securenet Option Board Schematic Diagram).

The voice encryption circuitry controls both the receive and transmit portions of the MCX1000 radio. When the radio is receiving, the voice encryption circuitry checks the signal. If the signal is coded, decrypted audio is routed to the radio speaker. If the signal is not coded, discriminator audio is routed to the radio speaker. When the radio is transmitting, the voice encryption circuitry routes either IDC audio or encrypted cipher to the radio modulating circuitry, depending upon the front panel mode setting.

Buffered discriminator output is routed to the voice encryption circuitry for code detection and audio reconstruction. The discriminator audio enters the board at J6003-4 as AMP DISC AUDIO. It first passes through an analog gate (U6105B), an equalizer (U6104B), and is then applied to U6100, where the signal is processed to recover the receive cipher and synchronize the clock. This IC also detects whether or not the discriminator signal is actually an eye pattern so that it can control the receive audio gates. Cipher text then goes to pin 9 of the encryption hybrid (U6103) via the RX CIPHER line where it is decrypted to produce the plain text. The plain text is routed (via the RX DATA line) to the CVSD modulator U6102, where the plain text is converted to an audio signal. This reconstructed audio is output from the CVSD modulator (via U6102-15) and routed back into the radio low level audio path by passing through analog switch U6105D to J6003-6 as RX BUS AUDIO. Microcomputer U6101 controls analog switch U6105D by the DECODE AUD ENABLE line (U6101-29). RX BUS AUDIO enters the Option Interconnect Board through P6003-6, where the signal proceeds to op amp U6002A and on to J366A-16 (RX OPTION SUMMER) to the Front Panel Interconnect Board. From this board the signal is routed to the Analog Interface Board and on to the OPT PLAY DE-EMPH GATE which is "on" for a coded signal. From this point on the

Analog Interface Board, the signal passes through the PL high pass filter and then on to the de-emphasis amplifier on the Main Board.

If the incoming signal is not encrypted, the signal path may be traced by referring to the Receiver Audio Block Diagram in the MCX1000 Radio service manual. After leaving the detector buffer on the Main Board, the discriminator audio (DISC AUDIO) passes through the DISC AUDIO MUTE GATE (on the Analog Interface Board). The signal then enters the PL high pass filter on the Analog Interface Board and proceeds to the De-emphasis amplifier on the Main Board.

When transmitting in the encryption mode, the MIC AUDIO MUTE GATE on the Main Board is turned off. Mic audio is routed through J6003-3, (MIC AUDIO) to U6104A where it is pre-emphasized, limited and filtered and then to the encryption circuitry to be digitized by the CVSD modulator (U6102). The CVSD modulator converts the audio waveform to a 12-kbps digital signal. This digital signal (the plain text) then goes to the encryption hybrid (U6103) by means of the TX DATA line (U6103-17). The hybrid encrypts the plain text to produce cipher text which enters the Control and Interface IC on the TX CIPHER line (U6100-25). The cipher text passes through a splatter filter within U6100 and exits through pin 27.

U6101-28, TX AUD ENABLE, controls the analog gate, U6105C, and allows the encrypted signal to pass through the deviation adjustment potentiometer, R6109. From potentiometer R6109, the encrypted signal passes through J6003-10 as TX BUS AUDIO. From this point, the signal crosses the Option Interconnect Board and enters the Front Panel Interconnect Board. After passing through a summing amplifier (U350B) on the Front Panel Interconnect Board, the signal proceeds to the Analog Interface Board. On the Analog Interface Board, the signal passes through the OPT TX FLAT GATE, then through an op amp before leaving the Analog Interface Board on the VCO IN line.

When transmitting in clear mode, refer to the Transmitter Audio Block Diagram in the MCX1000 Radio Service Manual for the audio path. Also, reference is made to the clear mode audio path in the appropriate board theory notes found in the MCX1000 Radio Service Manual.

## Key Insert Circuit

The key insert circuit allows an electronic key to be inserted into the encryption IC. The circuit is composed of three signal lines that are routed from the cable connector on the side of the radio to the Option Interconnect Board. The WE signal (P6100-7) goes directly to the encryption hybrid U6103 (pin 4) through R6166; WE goes low when a key is being loaded. The KEY signal (P6100-6) goes to the microprocessor and to the encryption hybrid, U6103. The microprocessor uses this line to determine when a key is being loaded in order to gate the verification tone to the RX AUDIO path. The KID signal (P6100-8) goes to the control and interface IC, U6100, to synchronize the clock with

the bits of the key insert signals. After the key is transferred to the radio, the key inserter sends an encrypted tone (verification tone) on the KID line to signal that a key has been transferred successfully.

If the radio is keyed in the encrypted mode, and if the encryption hybrid does not contain a valid key, no transmission takes place. In addition, depending on the type of encryption hybrid installed in the radio, there may be another indication of key loss. This indication consists of pulses of a 750 Hz. tone (100ms on, 100ms off) while the PTT button is activated, as well as the radio front panel display showing the phrase "NO KEY" for approximately 3 seconds after key-up.



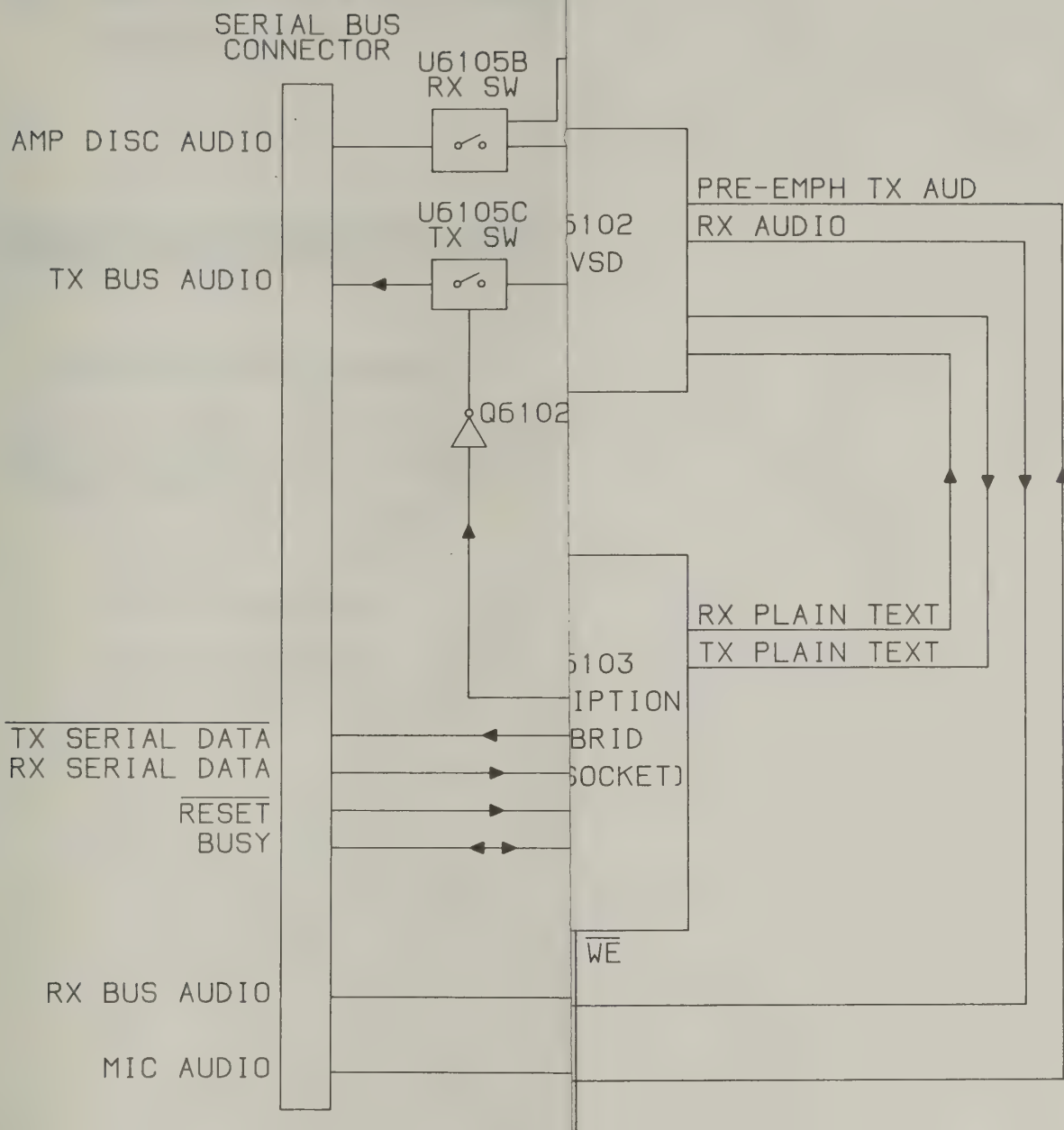


Figure 3-1  
Securenet Block Diagram

63C00703M-A

90428

## Key Insert Circuit

The key insert circuit allows an electronic key to be inserted into the encryption IC. The circuit is composed of three signal lines that are routed from the cable connector on the side of the radio to the Option Interconnect Board. The WE signal (P6100-7) goes directly to the encryption hybrid U6103 (pin 4) through R6166; WE goes low when a key is being loaded. The KEY signal (P6100-6) goes to the microprocessor and to the encryption hybrid, U6103. The microprocessor uses this line to determine when a key is being loaded in order to gate the verification tone to the RX AUDIO path. The KID signal (P6100-8) goes to the control and interface IC, U6100, to synchronize the clock with

the bits of the key insert signals. After the key is transferred to the radio, the key inserter sends an encrypted tone (verification tone) on the KID line to signal that a key has been transferred successfully.

If the radio is keyed in the encrypted mode, and if the encryption hybrid does not contain a valid key, no transmission takes place. In addition, depending on the type of encryption hybrid installed in the radio, there may be another indication of key loss. This indication consists of pulses of a 750 Hz. tone (100ms on, 100ms off) while the PTT button is activated, as well as the radio front panel display showing the phrase "NO KEY" for approximately 3 seconds after key-up.



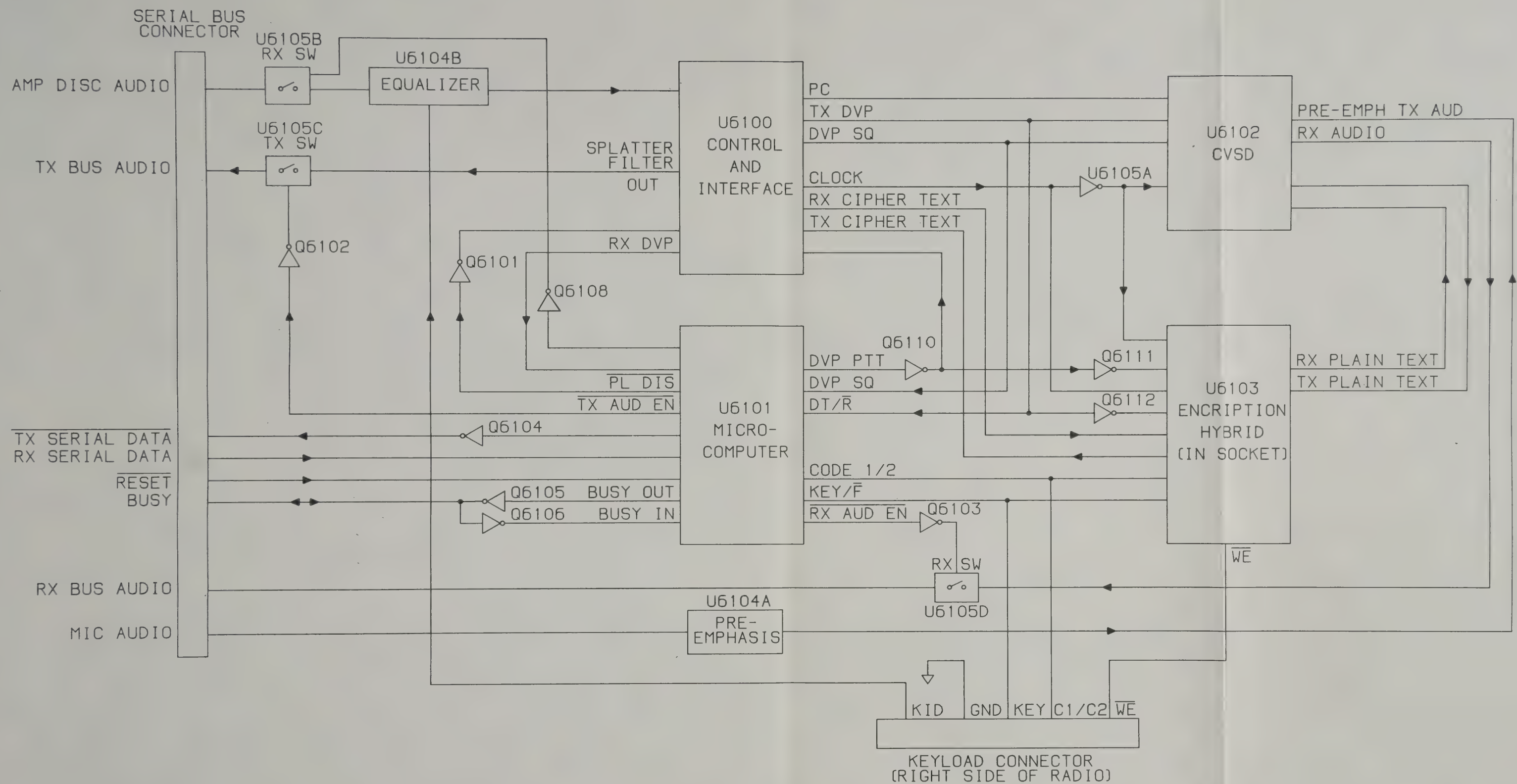


Figure 3-1  
Securenet Block Diagram

63C00703M-A 90428







**MOTOROLA LIMITED**

*Communications Division*

## SECTION 4 ENCRYPTION BOARD DETAILS, SCHEMATICS AND PARTS LISTS

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### 4.1 VOICE ENCRYPTION BOARDS

Following in Figures 4-1 to 4-6 are board details, schematics and parts lists for the printed circuit boards listed below.

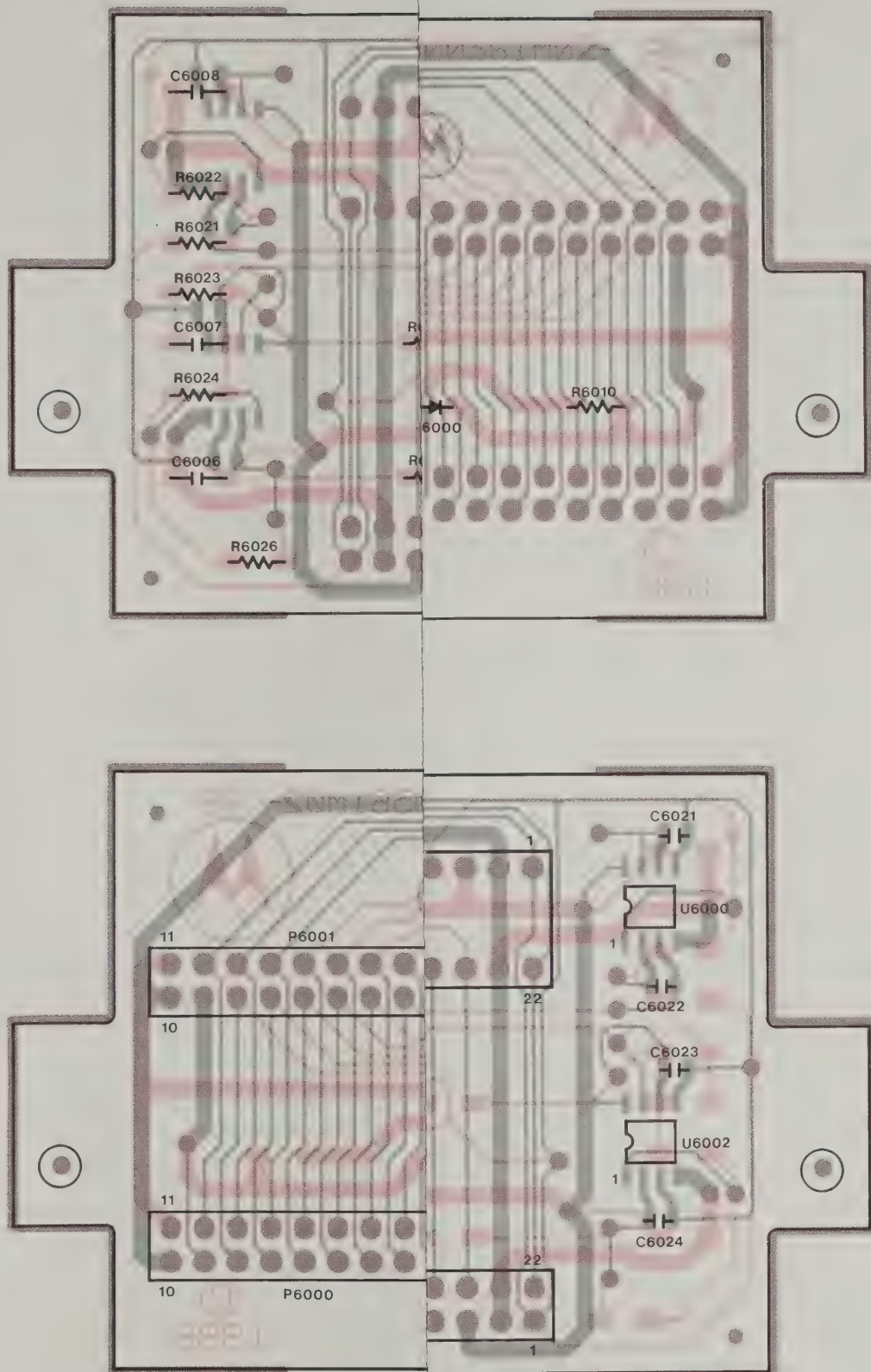
- Option Interconnect Board
- Securenet Option Board

### 4.2 OTHER RADIO BOARDS

With the exception of the two boards listed in Section 4.1, all printed circuit boards in the voice encrypted MCX1000 Radio are identical to the printed circuit boards in the non-encrypted radio and all details pertaining to these boards may be found in the MCX1000 Radio Service Manual. Note that the service manual for the digital capable radio should be used for reference as the information contained is specific to the digital capable radio.





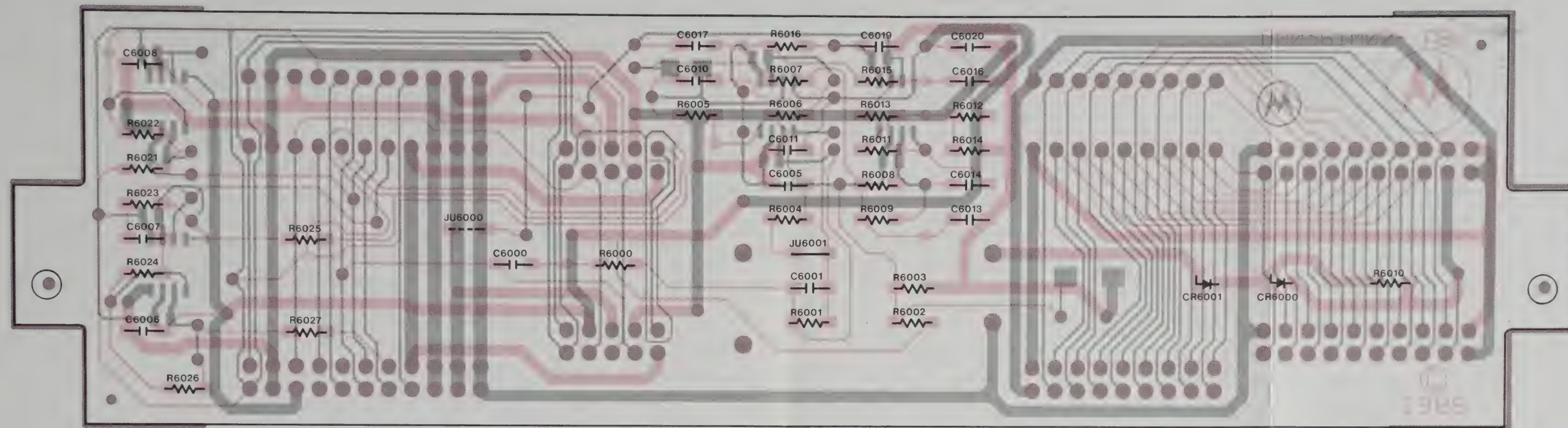


*Figure 4-1  
Option Interconnect Board-  
Board Details*

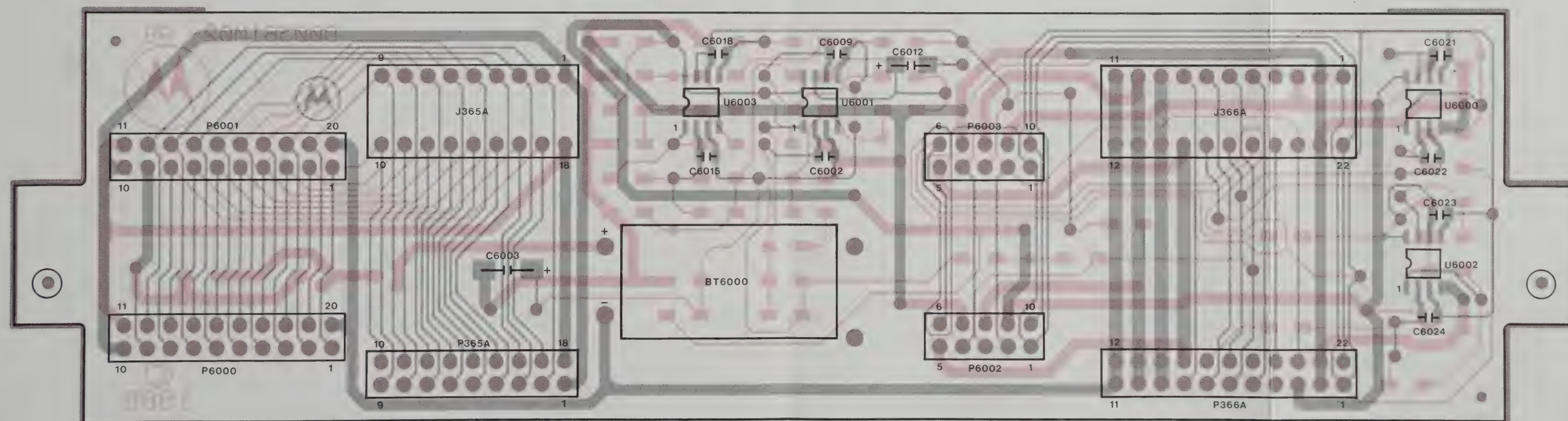
31H00254M-A 90116







SHOWN FROM SOLDER SIDE



SHOWN FROM COMPONENT SIDE

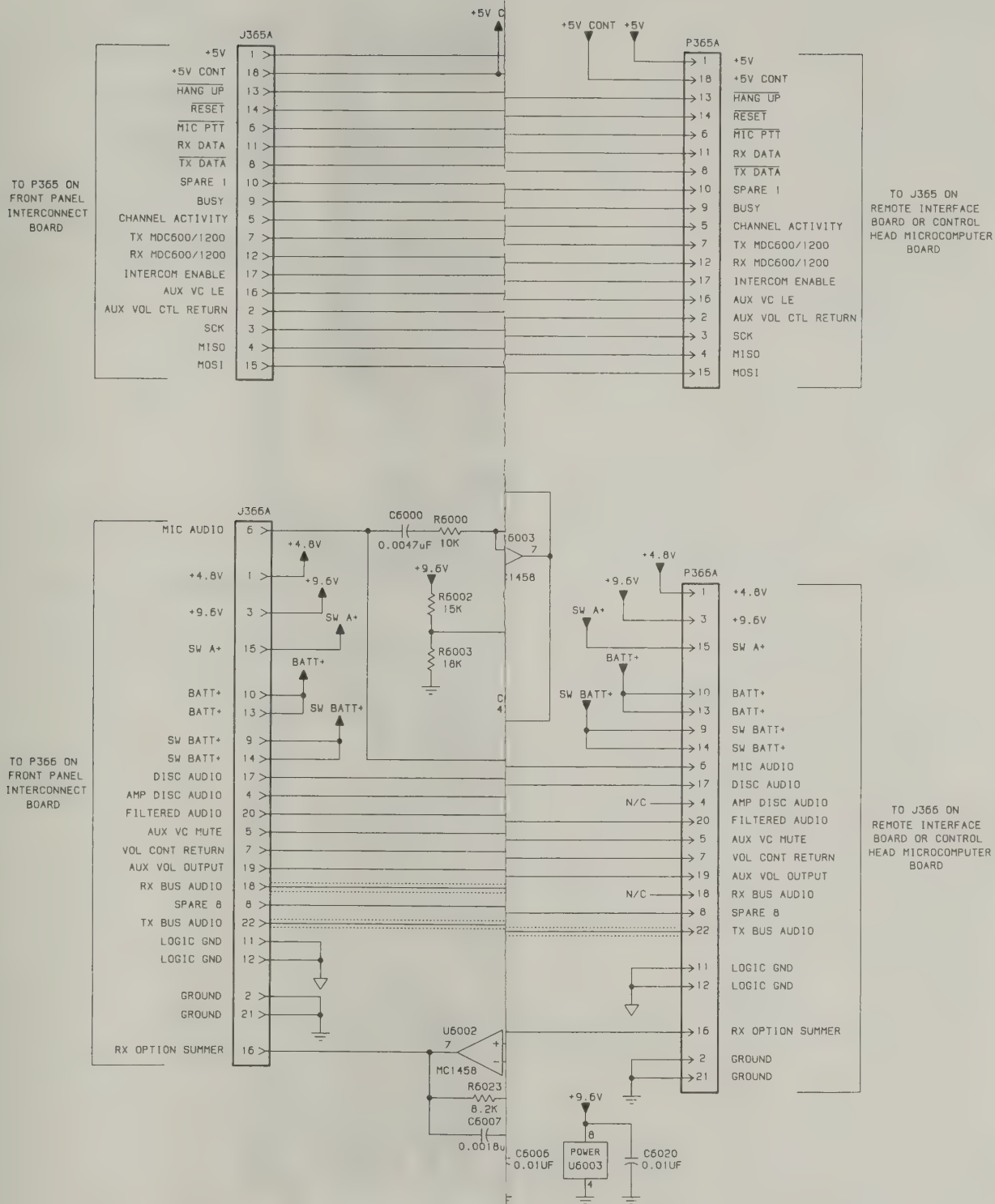
SOLDER SIDE - RED  
COMPONENT SIDE - GREY

Figure 4-1  
Option Interconnect Board-  
Board Details

31H00254M-A 90116







**Figure 4-2**  
**Option Interconnect Board**  
**Schematic**

63D00729M-A 90110







63D00729M-A 90110

## parts list

VLN5118B OPTION INTERCONNECT BOARD

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	91004
<b>Capacitor, chip, pF, 5%, 50V, X7R</b> (unless otherwise stated)			
C6000	2113741B37	0047uF	
C6001	2113740B51	120	
C6002	2113741A13	470	
C6003	2311049A18	TANT 10 uF-10-16V	
C6005	2113741B57	.033uF	
C6006	2113741B45	.01uF	
C6007	2113741B27	.0018uF	
C6008	2113741B45	.01uF	
C6009	2113741A13	470	
C6010	2113741B29	.0022uF	
C6011	2113741B45	.01uF	
C6012	2311049A08	TANT 1.0 uF-10-35V	
C6013	2113741B69	.1uF	
C6014	2113741B21	.001uF	
C6015	2113741A13	470	
C6016	2113740B76	.0015uF	
C6017	2113741B29	.0022uF	
C6018	2113741A13	470	
C6019	2113740B47	82	
C6020	2113741B45	.01uF	
C6021	2113741A13	470	
C6022	2113741A13	470	
C6023	2113741A13	470	
C6024	2113741A13	470	
<b>Diode, SOT-23</b>			
CR6000	4880154K04	SCHOTTKY	
CR6001	4880154K04	SCHOTTKY	
<b>Connector</b>			
J365A	0900076M01	18 PIN FEMALE	
J366A	0900076M07	22 PIN FEMALE	
P365A	2800043M01	MALE 18 POS 2X9	
P366A	2800043M07	MALE 22 POS 2X11	
<b>Jumper, chip</b>			
JU6001	0611077A01	ZERO OHM	
<b>Resistor, chip, 5%, 1/8W</b>			
R6000	0611077A98	10K	
R6001	0611077B31	220K	
R6002	0611077B03	15K	
R6003	0611077B05	18K	
R6004	0611077A80	1.8K	
R6005	0611077A80	1.8K	
R6006	0611077B07	22K	
R6007	0611077B18	62K	
R6008	0611077B18	62K	
R6009	0611077A65	430	
R6010	0611077A98	10K	
R6011	0611077A84	2.7K	
R6012	0611077B03	15K	
R6013	0611077B17	56K	
R6014	0611077B05	18K	
R6015	0611077B20	75K	
R6016	0611077B27	150K	
R6021	0611077B03	15K	
R6022	0611077B04	16K	
R6023	0611077A96	8.2K	
R6024	0611077A96	8.2K	
R6025	0611077A50	100	
R6026	0611077B03	15K	
R6027	0611077B03	15K	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
<b>Integrated Circuit, SOIC</b>		
U6000	5102006A01	DUAL OP AMP MC1458
U6001	5102006A01	DUAL OP AMP MC1458
U6002	5102006A01	DUAL OP AMP MC1458
U6003	5102006A01	DUAL OP AMP MC1458
<b>Non-referenced item</b>		
	2900026M01	TERMINAL PIN (60 used)
	8400361M02	PC BRD, OPT. INTERCONNECT

## parts list

VLN4874A CODE STORAGE BATTERY

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	90310
BT6000	6082804P02	BATTERY	

Figure 4-3  
Option Interconnect Board  
Parts List



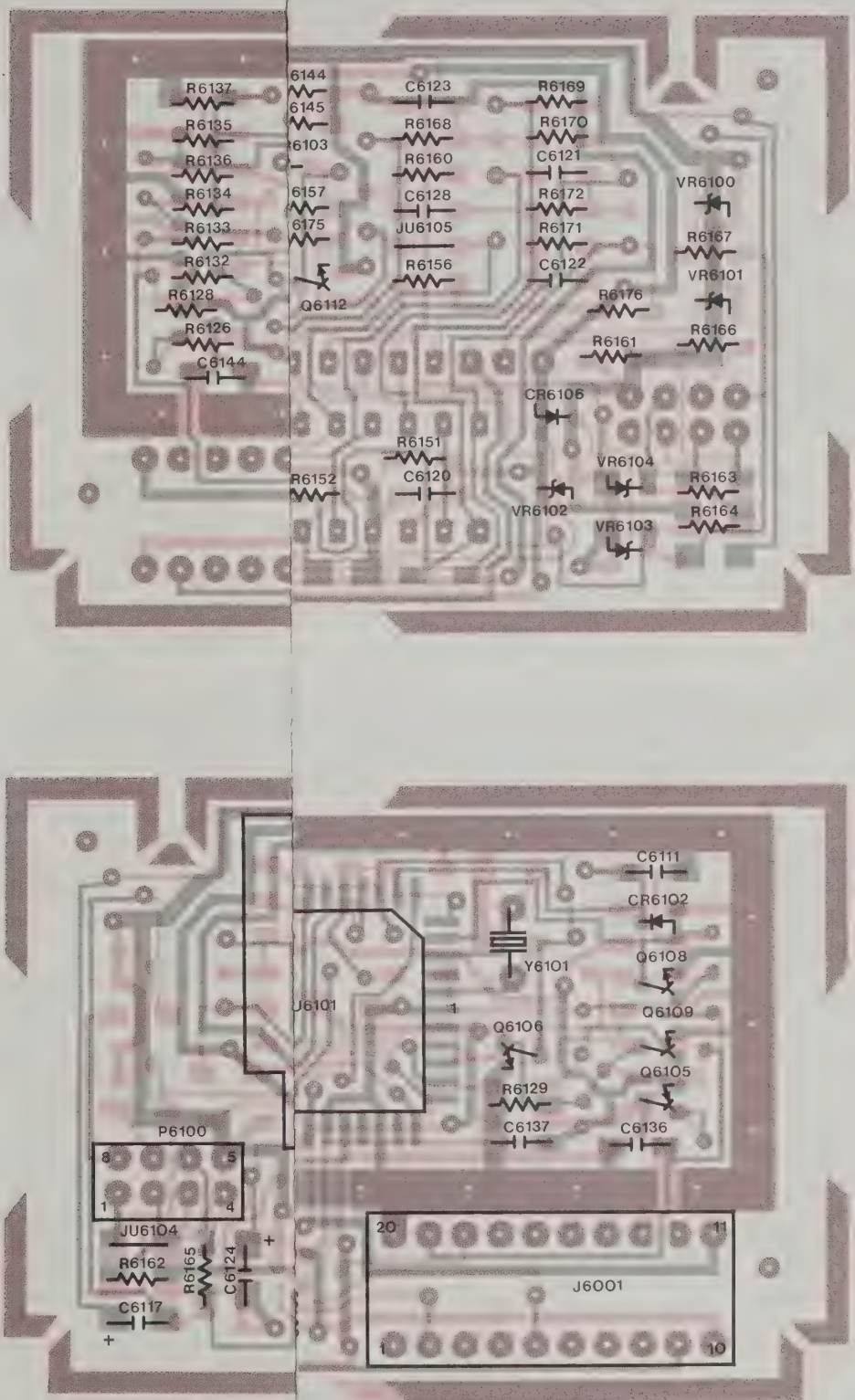


Figure 4-4A  
Securenet Option Board-  
Board Details  
(Early Version)

## parts list

VLN5118B OPTION INTERCONNECT BOARD

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	91004
<b>Capacitor, chip, pF, 5%, 50V, X7R</b> (unless otherwise stated)			
C6000	2113741B37	0047uF	
C6001	2113740B51	120	
C6002	2113741A13	470	
C6003	2311049A18	TANT 10 uF-10-16V	
C6005	2113741B57	.033uF	
C6006	2113741B45	.01uF	
C6007	2113741B27	.0018uF	
C6008	2113741B45	.01uF	
C6009	2113741A13	470	
C6010	2113741B29	.0022uF	
C6011	2113741B45	.01uF	
C6012	2311049A08	TANT 1.0 uF-10-35V	
C6013	2113741B69	.1uF	
C6014	2113741B21	.001uF	
C6015	2113741A13	470	
C6016	2113740B76	.0015uF	
C6017	2113741B29	.0022uF	
C6018	2113741A13	470	
C6019	2113740B47	82	
C6020	2113741B45	.01uF	
C6021	2113741A13	470	
C6022	2113741A13	470	
C6023	2113741A13	470	
C6024	2113741A13	470	
<b>Diode, SOT-23</b>			
CR6000	4880154K04	SCHOTTKY	
CR6001	4880154K04	SCHOTTKY	
<b>Connector</b>			
J365A	0900076M01	18 PIN FEMALE	
J366A	0900076M07	22 PIN FEMALE	
P365A	2800043M01	MALE 18 POS 2X9	
P366A	2800043M07	MALE 22 POS 2X11	
<b>Jumper, chip</b>			
JU6001	0611077A01	ZERO OHM	
<b>Resistor, chip, 5%, 1/8W</b>			
R6000	0611077A98	10K	
R6001	0611077B31	220K	
R6002	0611077B03	15K	
R6003	0611077B05	18K	
R6004	0611077A80	1.8K	
R6005	0611077A80	1.8K	
R6006	0611077B07	22K	
R6007	0611077B18	62K	
R6008	0611077B18	62K	
R6009	0611077A65	430	
R6010	0611077A98	10K	
R6011	0611077A84	2.7K	
R6012	0611077B03	15K	
R6013	0611077B17	56K	
R6014	0611077B05	18K	
R6015	0611077B20	75K	
R6016	0611077B27	150K	
R6021	0611077B03	15K	
R6022	0611077B04	16K	
R6023	0611077A96	8.2K	
R6024	0611077A96	8.2K	
R6025	0611077A50	100	
R6026	0611077B03	15K	
R6027	0611077B03	15K	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
<b>Integrated Circuit, SOIC</b>		
U6000	5102006A01	DUAL OP AMP MC1458
U6001	5102006A01	DUAL OP AMP MC1458
U6002	5102006A01	DUAL OP AMP MC1458
U6003	5102006A01	DUAL OP AMP MC1458
<b>Non-referenced item</b>		
	2900026M01	TERMINAL PIN (60 used)
	8400361M02	PC BRD, OPT. INTERCONNECT

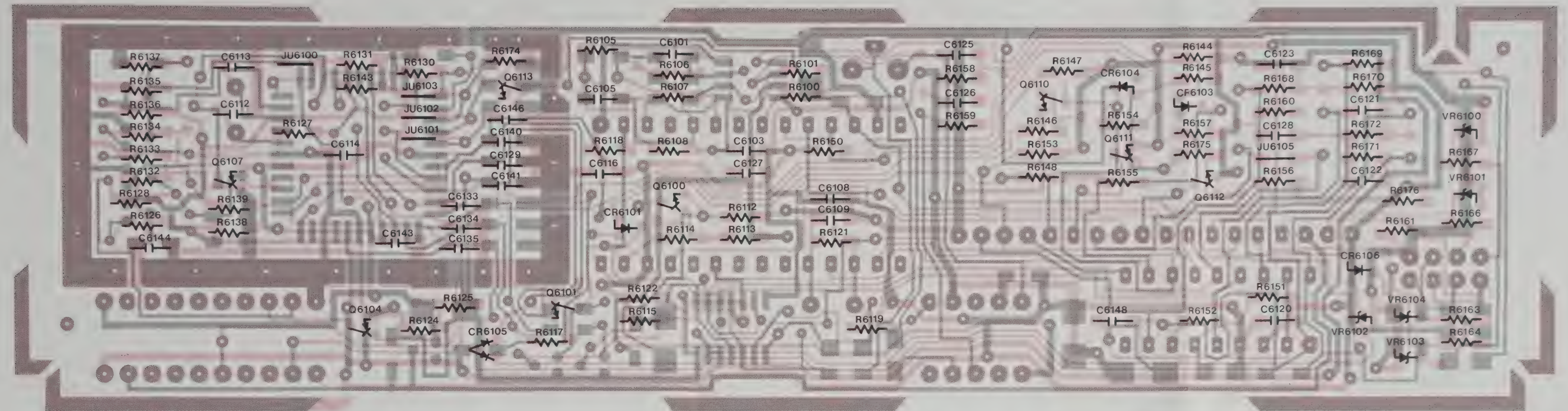
## parts list

VLN4874A CODE STORAGE BATTERY

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	90310
BT6000	6082804P02	BATTERY	

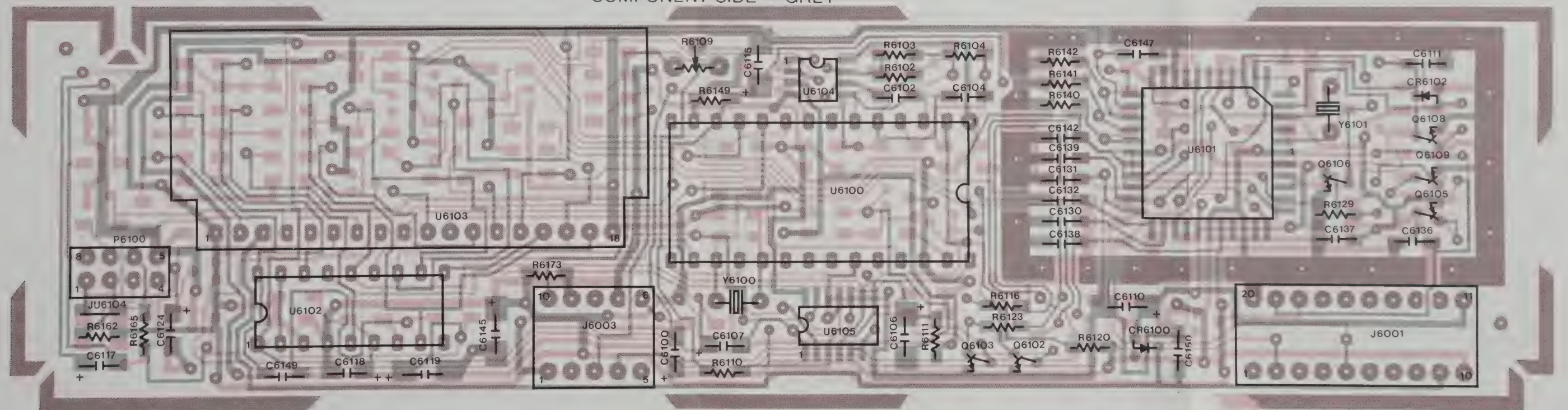
Figure 4-3  
Option Interconnect Board  
Parts List





SHOWN FROM SOLDER SIDE

SOLDER SIDE - RED  
COMPONENT SIDE - GREY



SHOWN FROM COMPONENT SIDE

SOLDER SIDE - RED  
COMPONENT SIDE - GREY

Figure 4-4A  
Securenet Option Board-  
Board Details  
(Early Version)



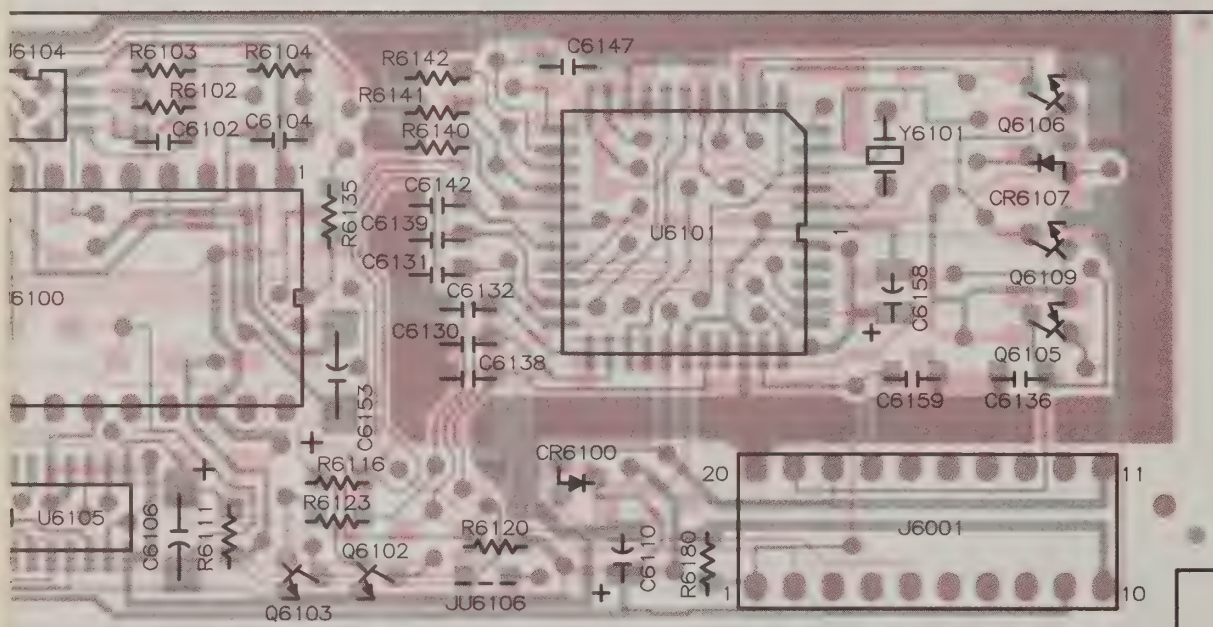
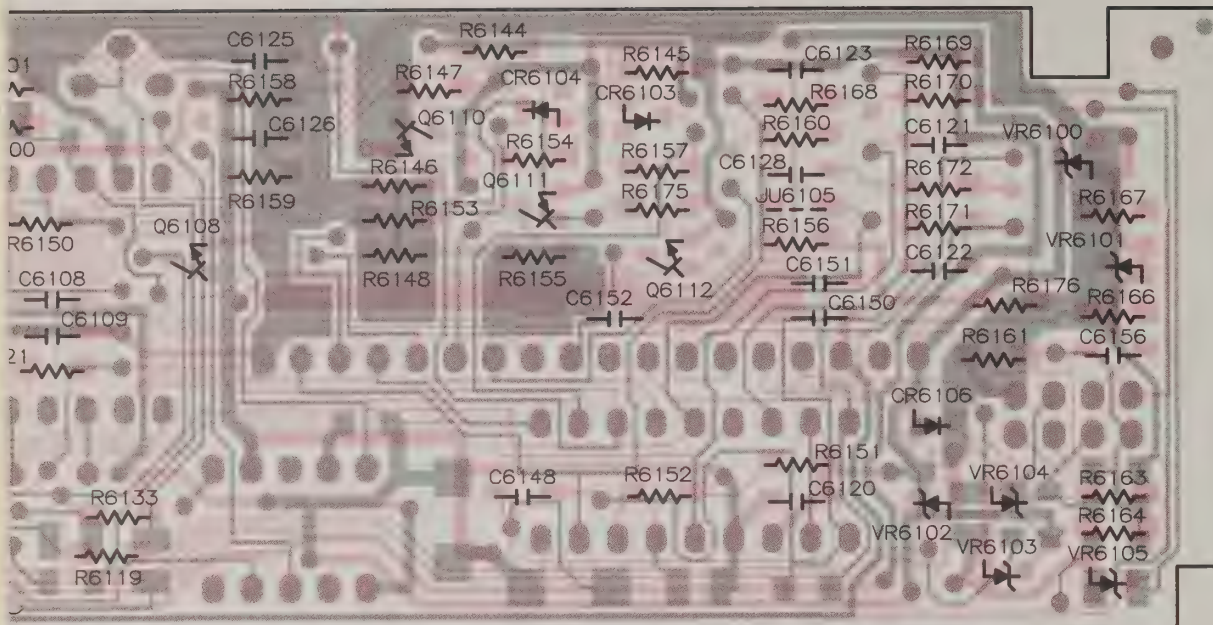
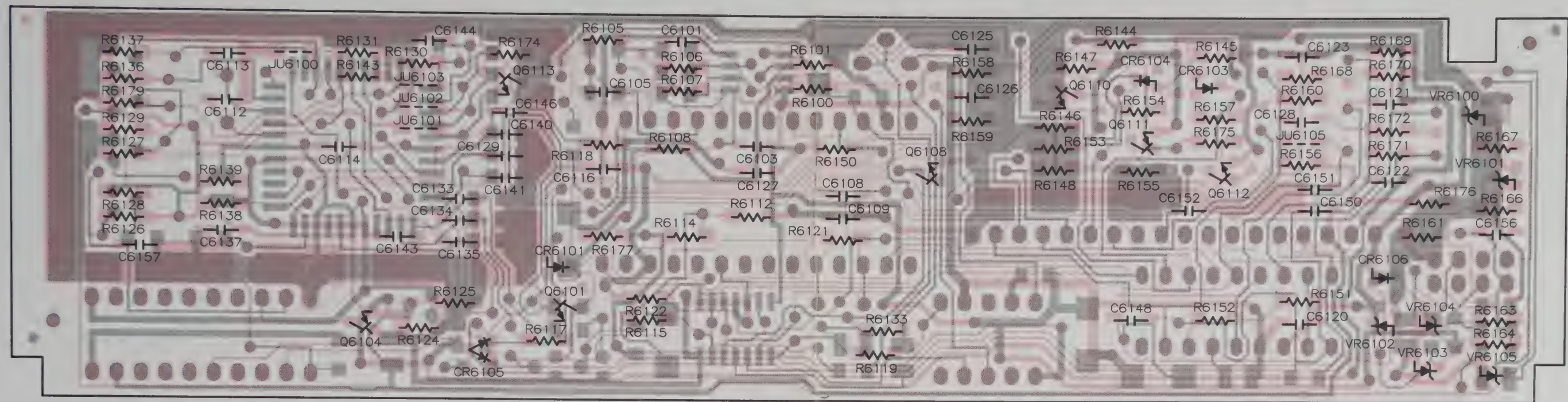


Figure 4-4B  
Securenet Option Board-  
Board Details  
(Later Version)

31H00205M-D 90405

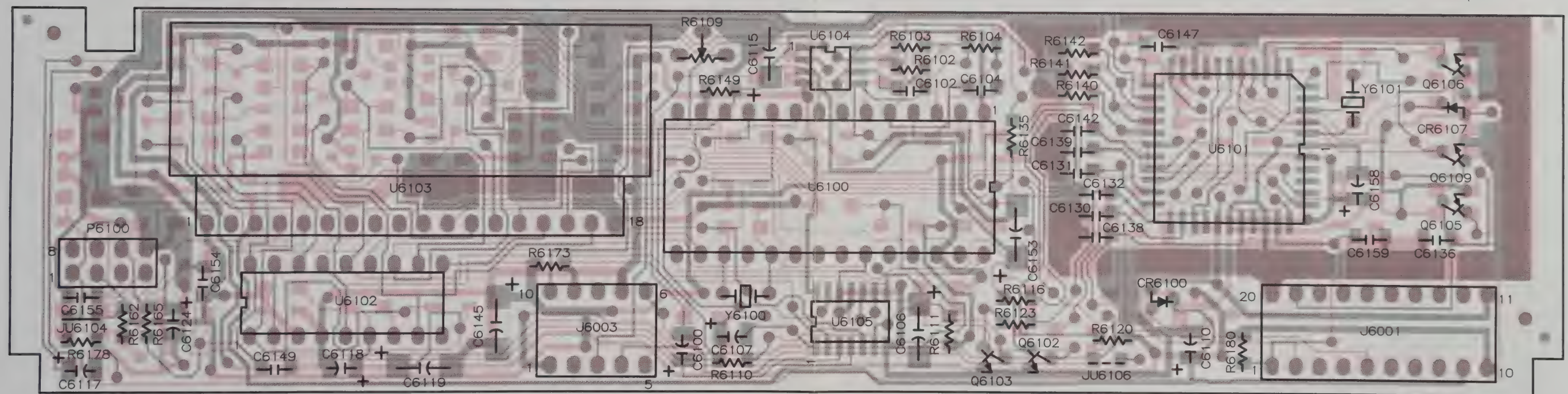






SHOWN FROM SOLDER SIDE

SOLDER SIDE - RED  
COMPONENT SIDE - GREY



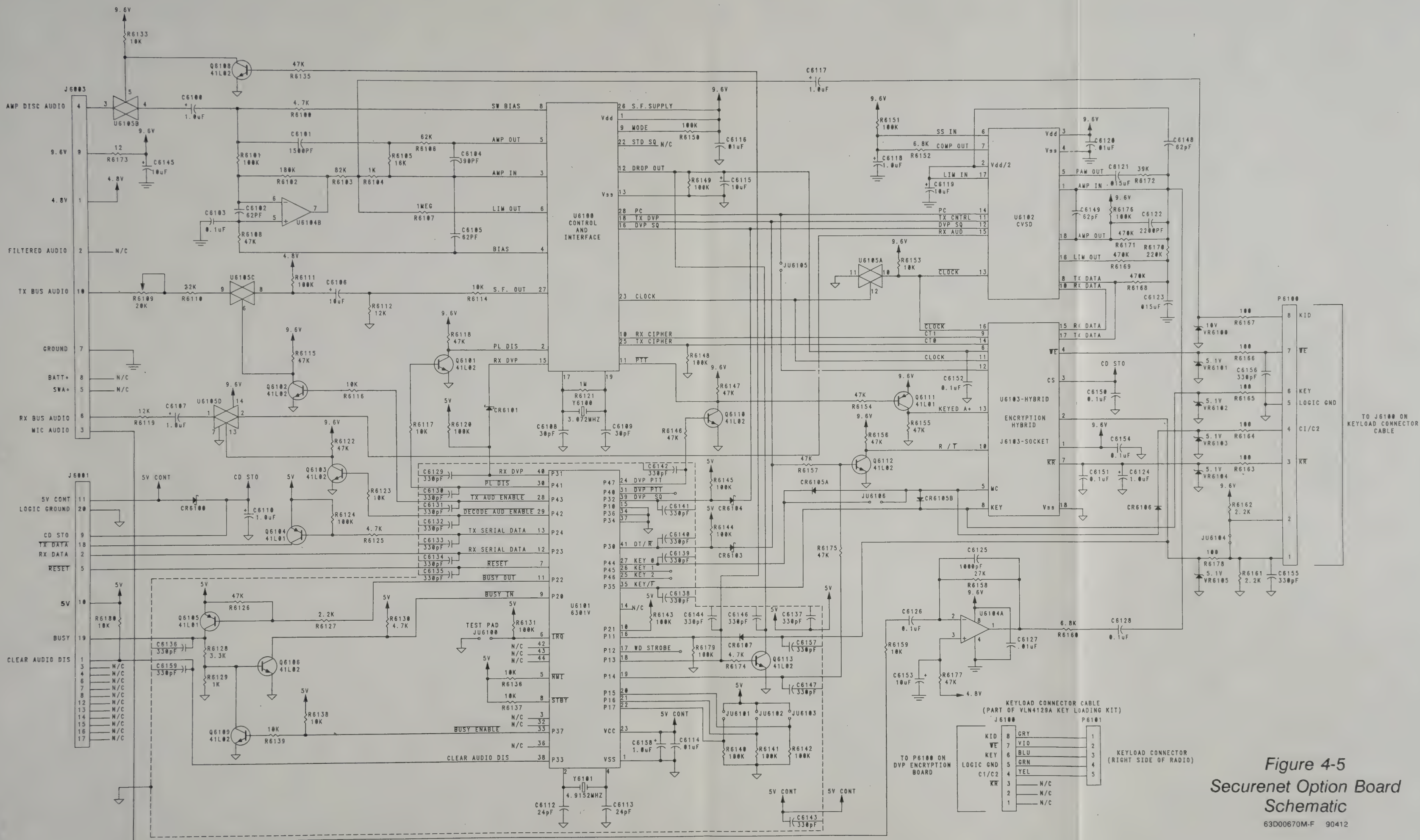
SHOWN FROM COMPONENT SIDE

SOLDER SIDE - RED  
COMPONENT SIDE - GREY

Figure 4-4B  
Securenet Option Board-  
Board Details  
(Later Version)

31H00205M-D 90405





REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R6160	0611077A94	6800
R6161	0611077A82	2200
R6162	0611077A82	2200
R6163	0611077A50	100
R6164	0611077A50	100
R6165	0611077A50	100
R6166	0611077A50	100
R6167	0611077A50	100
R6168	0611077B39	470K
R6169	0611077B39	470K
R6171	0611077B39	470K
R6170	0611077B31	220K
R6172	0611077B13	39K
R6173	0611077A28	12
R6174	0611077A90	4700
R6175	0611077B15	47K
R6176	0611077B23	100K
R6177	0611077B15	47K
R6178	0611077A50	100
R6179	0611077B23	100K
R6180	0611077A98	10K
<b>Integrated Circuit</b>		
U6100	5183977M38	DVP INTFC CTRL
U6101	FOR VLN4756C: 0102700A62	MICROCOMPUTER, SECURENET
	FOR QVLN4939C: 0102700A53	MICROCOMPUTER, SECURENET
U6102	5183977M33	SECURENET MODLTR DET
U6103		* SEE NOTE 2. BELOW
U6104	5102006A01	DUAL OP AMP SOIC
U6105	5183548N63	QUAD ANALOG SWITCH SOIC
<b>Diode, Zener</b>		
VR6100	4880140L15	SOT 10V
VR6101	4880140L06	SOT 5.1V
VR6102	4880140L06	SOT 5.1V
VR6103	4880140L06	SOT 5.1V
VR6104	4880140L06	SOT 5.1V
VR6105	4880140L06	SOT 5.1V
<b>Crystal</b>		
Y6100	4880113K01	QUARTZ 3.072 MHZ
Y6101	4880113K03	QUARTZ 4.9152 MHZ
<b>Non-referenced item</b>		
	1405160A01	Insulator (2 used)
	5400082M01	LABEL, barcode (QVLN4939C only)
	7580171L01	PAD, hybrid
	8400334M03	PC BRD, Securenet

- \*NOTES: 1. INTEGRATED CIRCUIT U6101 IS DEPENDENT ON THE SECURENET OPTION BOARD KIT BEING USED.
2. THE ENCRYPTION HYBRID PART NUMBER AND DESCRIPTION INFORMATION DEPENDS ON THE ENCRYPTION SCHEME CHOSEN. THIS INFORMATION IS AVAILABLE ON A SEPARATE SUPPLEMENT INFORMATION SHEET SUPPLIED WITH THE ENCRYPTION HARDWARE.

*Figure 4-6*  
**Securenet Option Board**  
**Parts List**



## SECTION 5. SECURITY HOUSING INFORMATION

### 5.1 GENERAL

The MCX1000 Security Housing may be used with any MCX1000 Digital Capable Radio with voice encryption, including units equipped for Base Station operation. The security housing provides the following features:

- An anti-tamper switch which erases the key variable stored in the encryption hybrid if an attempt is made to disassemble the housing.
- An erase button so that the same erase procedure mentioned above may be carried out manually by the radio operator.
- A key operated switch (called the keyload switch) which prevents unauthorized loading of a new key variable into the encryption hybrid.
- A key operated switch (called the operate/standby switch) which prevents unauthorized use of the voice encryption capability while allowing normal operation in the clear (non-encrypted) mode.
- A mechanical enclosure around the MCX1000 Radio which resists attempts to either remove the top and bottom covers of the main radio chassis or remove the radio from its location.

### 5.2 JUMPERING INFORMATION

When a security housing is used, jumper JU6104 on the Securenet Option Board is removed. This allows the operate/standby switch on the security housing to operate properly. JU6104 is located near plug P6100.

### 5.3 INSTALLATION

#### MOBILE APPLICATIONS

Refer to Figure 5-1 when mounting the security housing and the radio in a vehicle. This figure shows an exploded view of the mounting hardware required, which is contained in MBTRN4675A, Standard Mounting Hardware Kit. The security housing hardware for mobile applications is contained in VLN4141A.

Perform the steps below to mount the radio and security housing into the vehicle.

1. Position the bottom tray of the security housing (part # 0782633P01) with the radio mounting tray so that the four screw holes are aligned. Make sure the security housing bottom tray is placed underneath the radio mounting tray. Secure both trays to the desired location, using the four 10-16 screws, flat washers, and lock washers provided.
2. Position the radio into the mounting tray, aligning the four radio mounting holes with the holes in the sides of the tray.
3. Position the main security housing (part # 1582632P01) so that one side fits snugly into the security housing bottom tray. Make sure that the ground strap from the security housing makes direct contact with the radio chassis, as illustrated in Figure 5-1.
4. Fasten the four mounting tray screws into the sides of the radio.
5. Take the key loading cable (located on the side of the radio) and plug it into the 10 contact receptacle located inside the main security housing.



parts list

VLN4756C SECURENET OPTION BOARD (\*SEE NOTE 1)  
QVLN4939C SECURENET OPTION BOARD (\*SEE NOTE 1)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	01127
Capacitor, chip type, pf (unless stated otherwise)			
C6100	2311049A08	TANT 1.0 uf-10-35V	
C6101	2113740B76	1500-5-NPO-50V	
C6102	2113740B44	62-5-NPO-50V	
C6103	2113741B69	0.1-20-X7R-25V	
C6104	2113740B63	390-5-N330-50V	
C6105	2113740B44	62-5-NPO-50V	
C6106	2311049A18	TANT 10 uf-10-16V	
C6107	2311049A08	TANT 1.0 uf-10-35V	
C6108	2113740B36	30-5-NPO-50V	
C6109	2113740B36	30-5-NPO-50V	
C6110	2311049A08	TANT 1.0 uf-10-35V	
C6112	2113740B34	24-5-NPO-50V	
C6113	2113740B34	24-5-NPO-50V	
C6114	2113741B45	.01uf-10-X7R-50V	
C6115	2311049A18	TANT 10 uf-10-16V	
C6116	2113741B45	.01uf-10-X7R-50V	
C6117	2311049A08	TANT 1.0 uf-10-35V	
C6118	2311049A08	TANT 1.0 uf-10-35V	
C6119	2311049A18	TANT 10 uf-10-16V	
C6120	2113741B45	.01uf-10-X7R-50V	
C6121	2113741B49	.015uf-10-X7R-50V	
C6122	2113741B29	.0022uf-10-X7R-50V	
C6123	2113741B49	.015uf-10-X7R-50V	
C6124	2311049A08	TANT 1.0 uf-10-35V	
C6125	2113741B21	1000-5-NPO-50V	
C6126	2113741B69	0.1-20-X7R-25V	
C6127	2113741B45	.01uf-10-X7R-50V	
C6128	2113741B69	0.1-20-X7R-25V	
C6129	2113740B61	330-5-NPO-50V	
C6130	2113740B61	330-5-NPO-50V	
C6131	2113740B61	330-5-NPO-50V	
C6132	2113740B61	330-5-NPO-50V	
C6133	2113740B61	330-5-NPO-50V	
C6134	2113740B61	330-5-NPO-50V	
C6135	2113740B61	330-5-NPO-50V	
C6136	2113740B61	330-5-NPO-50V	
C6137	2113740B61	330-5-NPO-50V	
C6138	2113740B61	330-5-NPO-50V	
C6139	2113740B61	330-5-NPO-50V	
C6140	2113740B61	330-5-NPO-50V	
C6141	2113740B61	330-5-NPO-50V	
C6142	2113740B61	330-5-NPO-50V	
C6143	2113740B61	330-5-NPO-50V	
C6144	2113740B61	330-5-NPO-50V	
C6145	2311049A18	TANT 10 uf-10-16V	
C6146	2113740B61	330-5-NPO-50V	
C6147	2113740B61	330-5-NPO-50V	
C6148	2113740B44	62-5-NPO-50V	
C6149	2113740B44	62-5-NPO-50V	
C6150	2113741B69	0.1-20-X7R-25V	
C6151	2113741B69	0.1-20-X7R-25V	
C6152	2113741B69	0.1-20-X7R-25V	
C6153	2311049A18	TANT 10 uf-10-16V	
C6154	2113741B69	0.1-20-X7R-25V	
C6155	2113740B61	330-5-NPO-50V	
C6156	2113740B61	330-5-NPO-50V	
C6157	2113740B61	330-5-NPO-50V	
C6158	2311049A08	TANT 1.0 uf-10-35V	
C6159	2113740B61	330-5-NPO-50V	
Diode			
CR6100	4880154K04	SCHOTTKY	
CR6101	4880154K04	SCHOTTKY	
CR6102	4802003A01	SW SOT 23 914	
CR6103	4880154K04	SCHOTTKY	
CR6104	4880154K04	SCHOTTKY	
CR6105	4882060R02	DUAL 48R82060R01 A/P	
CR6106	4802003A01	SW SOT 23 914	
CR6107	4802003A01	SW SOT 23 914	
Connector			
J6003	0900076M12	FEM HORIZ 10 POS 2X5	
J6001	0900076M13	FEM HORIZ 20 POS 2X10	
J6103	0980073N03	SOCKET, hybrid	
P6100	2800043M04	8 PIN PLUG	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Jumper		
JU6104	0611077A01	ZERO OHM CHIP
	10001135944	wire #30, 2 inches
Transistor, SOT 23 Low Profile		
Q6101	4880141L02	NPN
Q6102	4880141L02	NPN
Q6103	4880141L02	NPN
Q6104	4880141L01	PNP
Q6105	4880141L01	PNP
Q6106	4880141L02	NPN
Q6108	4880141L02	NPN
Q6109	4880141L02	NPN
Q6110	4880141L02	NPN
Q6111	4880141L01	PNP
Q6112	4880141L02	NPN
Q6113	4880141L02	NPN
Resistor, chip type 5%-1/8W (unless stated otherwise)		
R6100	0611077A90	4700
R6101	0611077B23	100K
R6102	0611077B29	180K
R6103	0611077B21	82K
R6104	0611077A74	1000
R6105	0611077B04	16K
R6106	0611077B18	62K
R6107	0611077B47	1 MEG
R6108	0611077B15	47K
R6109	1883452F33	RES VAR 20K-10-1/2W
R6110	0611077B07	22K
R6111	0611077B23	100K
R6112	0611077B01	12K
R6114	0611077A98	10K
R6115	0611077B15	47K
R6116	0611077A98	10K
R6117	0611077A98	10K
R6118	0611077B15	47K
R6119	0611077B01	12K
R6120	0611077B23	100K
R6121	0611077B47	1 MEG
R6122	0611077B15	47K
R6123	0611077A98	10K
R6124	0611077B23	100K
R6125	0611077A90	4700
R6126	0611077B15	47K
R6127	0611077A82	2200
R6128	0611077A86	3300
R6129	0611077A74	1000
R6130	0611077A90	4700
R6131	0611077B23	100K
R6133	0611077A98	10K
R6135	0611077B15	47K
R6136	0611077A98	10K
R6137	0611077A98	10K
R6138	0611077A98	10K
R6139	0611077A98	10K
R6140	0611077B23	100K
R6141	0611077B23	100K
R6142	0611077B23	100K
R6143	0611077B23	100K
R6144	0611077B23	100K
R6145	0611077B23	100K
R6146	0611077B15	47K
R6147	0611077B15	47K
R6148	0611077B23	100K
R6149	0611077B23	100K
R6150	0611077B23	100K
R6151	0611077B23	100K
R6152	0611077A94	6800
R6153	0611077A98	10K
R6154	0611077B15	47K
R6155	0611077B15	47K
R6156	0611077B15	47K
R6157	0611077B15	47K
R6158	0611077B09	27K
R6159	0611077A98	10K

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R6160	0611077A94	6800
R6161	0611077A82	2200
R6162	0611077A82	2200
R6163	0611077A50	100
R6164	0611077A50	100
R6165	0611077A50	100
R6166	0611077A50	100
R6167	0611077A50	100
R6168	0611077B39	470K
R6169	0611077B39	470K
R6171	0611077B39	470K
R6170	0611077B31	220K
R6172	0611077B13	39K
R6173	0611077A28	12
R6174	0611077A90	4700
R6175	0611077B15	47K
R6176	0611077B23	100K
R6177	0611077B15	47K
R6178	0611077A50	100
R6179	0611077B23	100K
R6180	0611077A98	10K
Integrated Circuit		
U6100	5183977M38	DVP INTFC CTRL
U6101	FOR VLN4756C: 0102700A62 FOR QVLN4939C: 0102700A53	MICROCOMPUTER, SECURENET
U6102	5183977M33	MICROCOMPUTER, SECURENET
U6103		SECURENET MODLTR DET
U6104	5102006A01	* SEE NOTE 2. BELOW
U6105	5183548N63	DUAL OP AMP SOIC
		QUAD ANALOG SWITCH SOIC
Diode, Zener		
VR6100	4880140L15	SOT 10V
VR6101	4880140L06	SOT 5.1V
VR6102	4880140L06	SOT 5.1V
VR6103	4880140L06	SOT 5.1V
VR6104	4880140L06	SOT 5.1V
VR6105	4880140L06	SOT 5.1V
Crystal		
Y6100	4880113K01	QUARTZ 3.072 MHZ
Y6101	4880113K03	QUARTZ 4.9152 MHZ
Non-referenced item		
	1405160A01	Insulator (2 used)
	5400082M01	LABEL, barcode (QVLN4939C only)
	7580171L01	PAD, hybrid
	8400334M03	PC BRD, Securenet

- \*NOTES: 1. INTEGRATED CIRCUIT U6101 IS DEPENDENT ON THE SECURENET OPTION BOARD KIT BEING USED.
2. THE ENCRYPTION HYBRID PART NUMBER AND DESCRIPTION INFORMATION DEPENDS ON THE ENCRYPTION SCHEME CHOSEN. THIS INFORMATION IS AVAILABLE ON A SEPARATE SUPPLEMENT INFORMATION SHEET SUPPLIED WITH THE ENCRYPTION HARDWARE.

Figure 4-6  
Securenet Option Board  
Parts List



## SECTION 5. SECURITY HOUSING INFORMATION

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### 5.1 GENERAL

The MCX1000 Security Housing may be used with any MCX1000 Digital Capable Radio with voice encryption, including units equipped for Base Station operation. The security housing provides the following features:

- An anti-tamper switch which erases the key variable stored in the encryption hybrid if an attempt is made to disassemble the housing.
- An erase button so that the same erase procedure mentioned above may be carried out manually by the radio operator.
- A key operated switch (called the keyload switch) which prevents unauthorized loading of a new key variable into the encryption hybrid.
- A key operated switch (called the operate/standby switch) which prevents unauthorized use of the voice encryption capability while allowing normal operation in the clear (non-encrypted) mode.
- A mechanical enclosure around the MCX1000 Radio which resists attempts to either remove the top and bottom covers of the main radio chassis or remove the radio from its location.

### 5.2 JUMPERING INFORMATION

When a security housing is used, jumper JU6104 on the Securenet Option Board is removed. This allows the operate/standby switch on the security housing to operate properly. JU6104 is located near plug P6100.

### 5.3 INSTALLATION

#### MOBILE APPLICATIONS

Refer to Figure 5-1 when mounting the security housing and the radio in a vehicle. This figure shows an exploded view of the mounting hardware required, which is contained in MBTRN4675A, Standard Mounting Hardware Kit. The security housing hardware for mobile applications is contained in VLN4141A.

Perform the steps below to mount the radio and security housing into the vehicle.

1. Position the bottom tray of the security housing (part # 0782633P01) with the radio mounting tray so that the four screw holes are aligned. Make sure the security housing bottom tray is placed underneath the radio mounting tray. Secure both trays to the desired location, using the four 10-16 screws, flat washers, and lock washers provided.
2. Position the radio into the mounting tray, aligning the four radio mounting holes with the holes in the sides of the tray.
3. Position the main security housing (part # 1582632P01) so that one side fits snugly into the security housing bottom tray. Make sure that the ground strap from the security housing makes direct contact with the radio chassis, as illustrated in Figure 5-1.
4. Fasten the four mounting tray screws into the sides of the radio.
5. Take the key loading cable (located on the side of the radio) and plug it into the 10 contact receptacle located inside the main security housing.



6. Place the angled end of the side plate (part # 1582631P01) into the security housing bottom tray. Close the side plate and fasten it to the housing by means of the two 6-32 X  $\frac{1}{4}$ " screws and #6 lock washers provided. This completes the installation of the security housing.

## BASE STATION APPLICATIONS

Figure 5-2 gives an exploded view and parts list for VLN5190A which is a part of the Security Base Station Tray Kit, VLN1156B. VLN5190A is assembled prior to shipping and is illustrated for reference only. If desired, the security housing assembly may be secured to a suitable mounting surface by placing two #10 X  $3\frac{1}{2}$ " screws (reference #2 of Figure 5-2) through the mounting tray/speaker housing assembly and into pre-drilled holes in the mounting surface. To mount the base station radio into the security housing and mounting tray, perform the above steps describing mobile installations, beginning with step #2.

## 5.4 OPERATING INSTRUCTIONS

Radio operation depends in some ways on the type of encryption being used in the radio. Also, differences in operation occur with radios equipped with the security housing. These differences are described in the following paragraphs.

### KEY INSERTION INFORMATION

To load a key variable into a radio equipped with the security housing, the Keyload Switch must be in the "Keyload" position. Also, the Operate/ Standby Switch must be in the "Operate" position. Instructions for loading a key variable into an MCX1000 Radio are provided in separate instruction manuals specific to the Key Code Inserter being used.

### TRANSMIT AND RECEIVE OPERATION

For radios equipped with the security housing, the Operate/Standby Switch must be in the "Operate" position in order to transmit or receive messages in the encrypted mode. Standard messages (non-encrypted) may be transmitted and received with the switch in either position.

### KEY LOSS INDICATION

Refer to Section 3.2 (under the heading Key Insert Circuit) for information regarding indications of loss

of the key code in the voice encrypted MCX1000 Radio.

### ERASE BUTTON

For radios equipped with the security housing, an Erase Button is provided on the security housing so that the radio operator may set the key variable in the radio to zero. Erasing occurs regardless of the position of any other switch, including the ON/OFF switch. The radio does not transmit or receive encrypted messages until another key has been transferred to the radio.

## 5.5 SECURITY HOUSING EXPLODED VIEW

Figure 5-3 shows the Security Housing Exploded View and gives a parts list for the VLN5189A (Base Station) and VLN4141A (Standard) Security Housings. VLN5189A is identical in content to VLN4141A except that part # 0782633P01 has been moved to VLN5190A, Security Base Station Mounting Tray Kit to facilitate assembly of the mounting tray kit prior to shipment. Both VLN5189A and VLN5190A are contained within VLN1156B, Security Base Station Tray Kit.

### SECURITY HOUSING WIRING DIAGRAM

Figure 5-4 shows the security housing wiring diagram, which is a part of VLN4141A/VLN5189A.

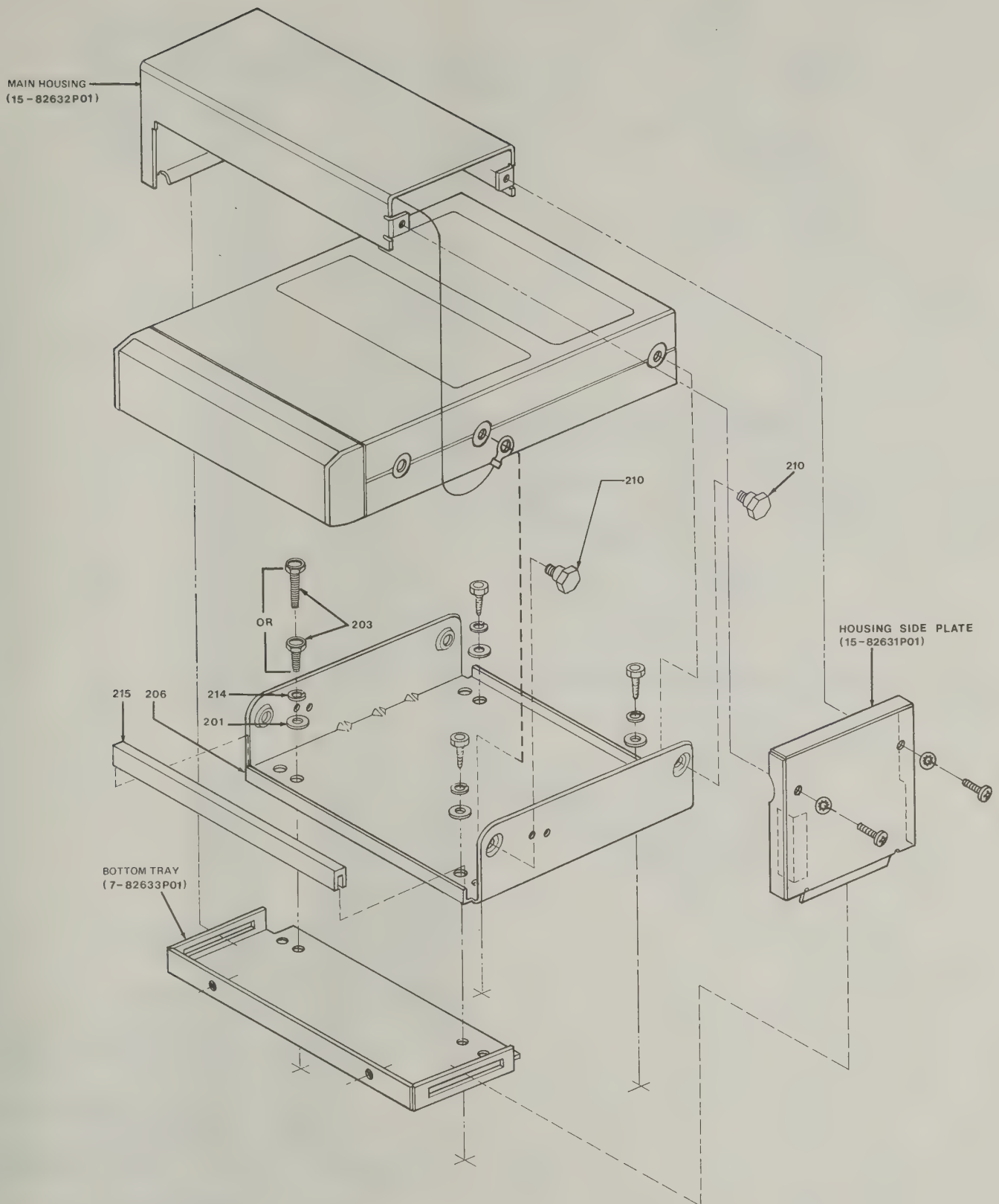
## 5.6 SERVICING

Special procedures are required for servicing radios equipped with the security housing. These procedures must be used, and are required if the radio is to be operated in the encrypted mode while the security housing is removed.

To operate the radio in the encrypted mode with the security housing removed, first reconnect the keyload cable. Then, with the security housing removed, secure the side security housing plate to the main radio housing with the supplied screws. With the side security housing plate in place, the anti-tamper switch is depressed. This allows for encrypted mode operation of the radio as if the security housing was in place around the radio.

To reassemble the radio, it is necessary to remove the side security housing plate. This action activates the anti-tamper switch which erases the key variable used during servicing or testing.





MBTRN4675A STANDARD MOUNTING HARDWARE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	80906
------------------	-------------------	-------------	-------

201	0400008285	WASHER, flat, 4 used	
203	0300138021	SCREW, tapping, 10-16X3/4 4 used	
203	0300139926	SCREW, tap'ng, 10-16X1-1/2 4 used	
206	0700306M01	BRACKET, mounting tray	
210	0384867M01	SCREW, M5-0 8X7, radio mtg, 4 used	
214	0400119332	WASHER, lock #10 split, 4 used	
215	4682540N01	CHANNEL, rubber	

Figure 5-1  
Security Housing Assembly Detail

69C00434M-A 90410

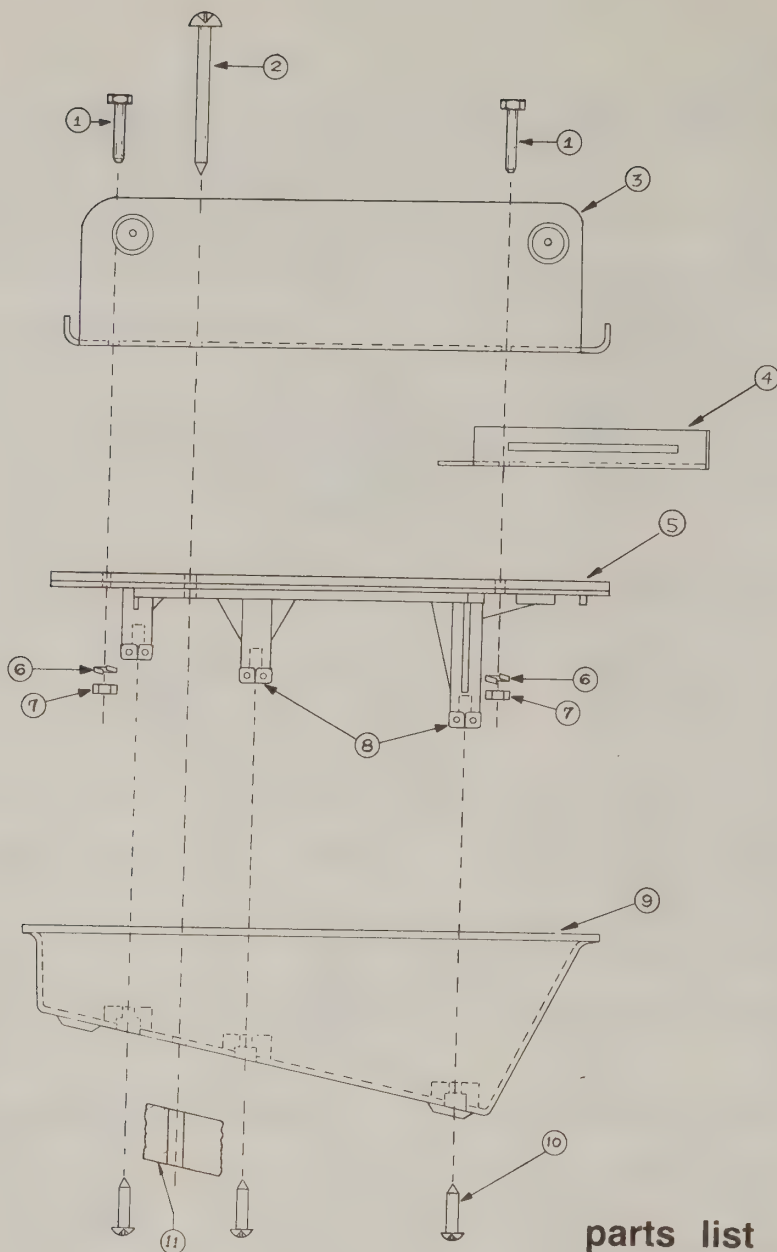


Figure 5-2  
Security Base Station  
Mounting Tray  
Exploded View and  
Parts List

69C00416M-D 90410

## parts list

VLN5190A SECURITY BASE STATION MOUNTING TRAY KIT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	90811
1	0300034M04	SCR HEX M5X0.8X12 SSTPAS (4 used)	
2	0300043M03	SCR THD CUT #10X 3.5 IN LG (2 used)	
3	0700309M01	TRAY, mtg rework	
4	0782633P01	BRACKET, tray	
5	1500339M01	COVER, rework	
6	0400119332	WSHR LCK 10 MEDSPT STL CAD (4 used)	
7	0210971A39	NUT MCH, M5X0.8 HEX SSTPAS (4 used)	
8	3882132N01	CAP, plas boss (5 used)	
9	1500340M01	HOUSING, rework	
10	0300122916	SCR TPG 8-15X5/8 PHLPAN A CHS (5 used)	
11		Mounting Surface, pre-drilled for ref. #2	
<b>Non-referenced items</b>			
0180735D98		B/STN CABLE KIT contains:	
0984151B03		CONNECTOR, receptacle	
3083155H01		CABLE, 2 conductor	
0384867M01		SCR MCH M5X0.8X7 PLNHEX STL (4 used)	
1484566B01		INSULATOR, conn	
3300201M08		NAMEPLATE	
3302002A01		NAMEPLATE	
4282018H18		RETAINER, cable	
4282105N01		CLIP, speaker (2 used)	
4682540N01		BUMPER, channel	
5084401D01		SPEAKER, 2-ohm	
7582172N01		PAD, speaker (2 used)	
7583951F01		BUMPER, rubber (4 used)	

NOTE:

VLN5190A IS CONTAINED WITHIN VLN1156B, SECURITY BASE STATION MOUNTING TRAY.

## parts list

VLN4141A SECURITY HOUSING HARDWARE KIT  
VLN5189A DVP BASE STATION SECURITY HOUSING HARDWARE KIT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	0100886M09	ASSEM DVP SECURITY HS (refer to Figure 5-4) contain
P103	0984279D03	CONNECTOR, crimp (1
J106	1484277D17	HOUSING, conn
	1484277D18	HOUSING, conn
	2284835F01	PIN, nylon plrz
	2884528K62	PLUG, ckt brd 10 pin
	3010286L60	WIRE, 26 str orange 6
	3010286L61	WIRE, 26 str yel 6.25 i
	3010286L62	WIRE, 26 str grn 6.25 i
	3010286L67	WIRE, 26 str blk 6.25 i
	3010286L68	WIRE, 26 str blue 6.25
	3010286L69	WIRE, 26 str vio 6.25 i
	3010286L70	WIRE, 26 str gray 6.25
	3010286M11	WIRE, 26 str red 6.25 i
	3782633B14	GROMMET, rubber
	4210217A02	TIE WRAP, nylon white
1	0300135961	SCR MCH 6-32X1/4 PHLBI
2	0300136784	SCR MCH 2-56X5/8 PHLPA
3	0300136998	SCR MCH 4-40X1/2 PHLBI
4	0300138810	SCR MCH 4-40X5/8 PHLBI
5	0400002642	WASHER, lock 7/16 INT ST
6	0400007650	WASHER, lock 6 INT STL C
7	0400007667	WASHER, lock 4 EXT STL C
8	0400129021	WASHER, lock 3/4 INT STL
9	0782633P01	BRACKET, tray (VLN4141A
10	0783083P01	BRACKET, switch
11	3883322P01	BUTTON, sw red
12	0980263D01	CONNECTOR, 5 pin male
13	5580128E01	LOCK, security spdt elec
14	1582631P01	COVER, housing back
15	1582632P01	HOUSING, main
16	1583080P01	HOUSING, receptacle BHD
17	6483082P01	PLATE, SW
18	4082293F02	SWITCH, snap 1 A 125V (2
19	4082738P01	SWITCH, pb dpst
20	4583081P01	CAM LOCK
21	2900122020	LUG, solid brass HT TN
22	2900865065	LUG
23	3010286A12	WIRE, 16 stiv bk 8 in
Non-referenced items		
	0984279D03	CONNECTOR, crimp (8 use
	2284835F01	PIN, nylon plrz
	3010286L63	WIRE, 26 str brn/blu 7.313
	3010286L73	WIRE, 26 str red/blk 7.7 in
	3010286L76	WIRE, 26 str yel/red 5.875
	3010286L81	WIRE, 26 str wht/bkt 2.75 i
	3010286L83	WIRE, 26 str wht/org 2.75 i
	3010286L84	WIRE, 26 str wht/yel 5.875
	3010286L85	WIRE, 26 str wht/grn 4.7 in
	3010286L86	WIRE, 26 str wht/blu 5.875
	3010286L95	WIRE, 26 str grn/wht 8.25 i
	3010286L99	WIRE, 26 str wht/vio 5 in
	3010286M30	WIRE, 26 str red/grn 4.313
	3010286M36	WIRE, 26 str org/grn 8 in
	3383260P06	NAMEPLATE, DVP
	3700132026	TBG HS POLYOL 3/16 CLR
	3700132626	TBG HS POLYOL 3/32 CLR
	4210217A02	TIE WRAP, nylon white (5 u

NOTE: VLN5189A IS CONTAINED WITHIN VLN1156B, S  
BASE STATION MOUNTING TRAY.

VLN4290A KEYLOAD LOCK

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
24	5584348N03	KEYLOAD LOCK

VLN4335A CHASSIS EXTENSION KIT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1584663N01	CASTING, chassis exten

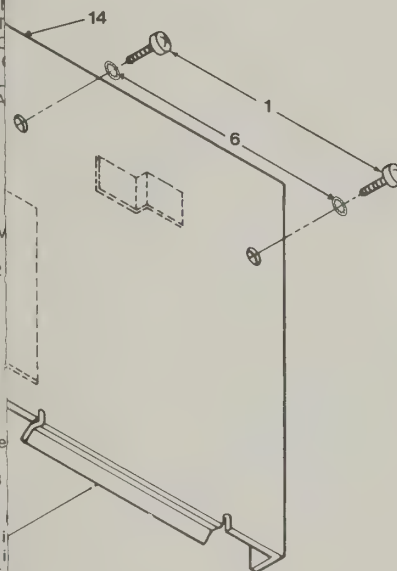
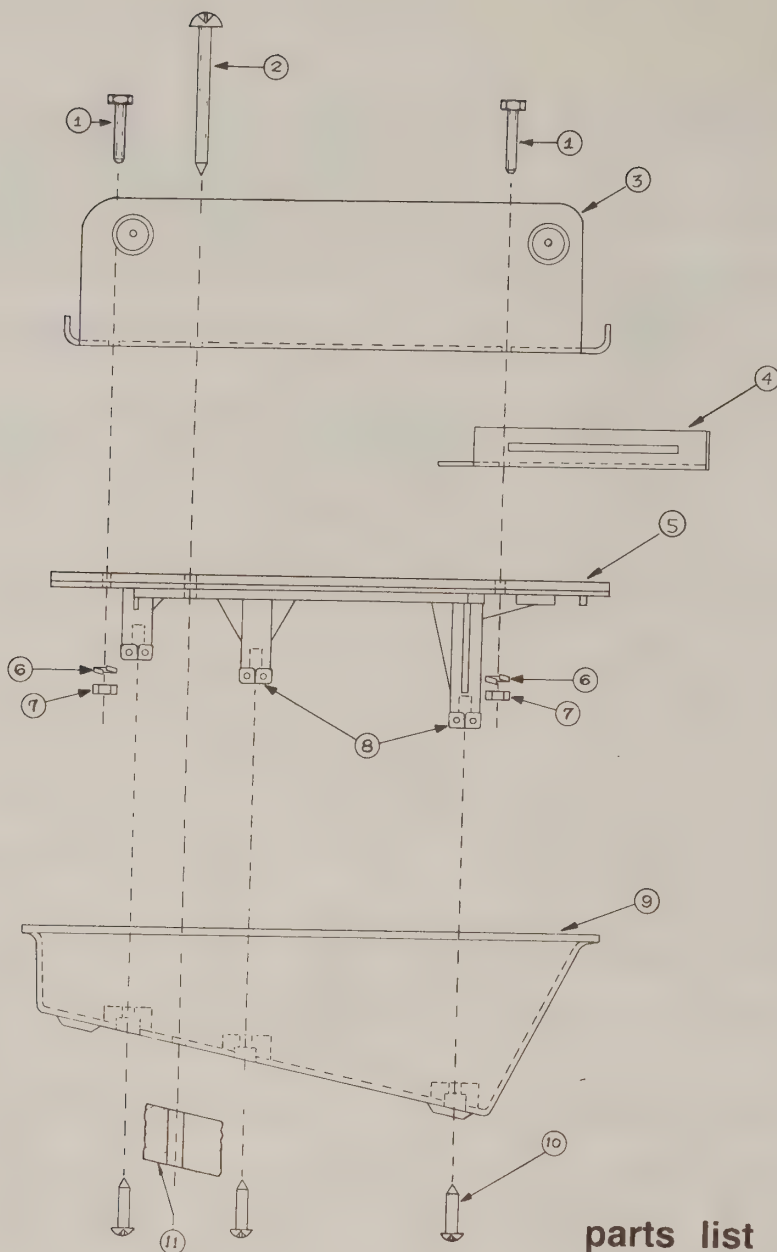


Figure 5-3  
Security Housing  
Exploded View and  
Parts List

69E00440M-O 90412





## parts list

VLN5190A SECURITY BASE STATION MOUNTING TRAY KIT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	90811
1	0300034M04	SCR HEX M5X0.8X12 SSTPAS (4 used)	
2	0300043M03	SCR THD CUT #10X 3.5 IN LG (2 used)	
3	0700309M01	TRAY, mtg rework	
4	0782633P01	BRACKET, tray	
5	1500339M01	COVER, rework	
6	0400119332	WSHR LCK 10 MEDSPT STL CAD (4 used)	
7	0210971A39	NUT MCH, M5X0.8 HEX SSTPAS (4 used)	
8	3882132N01	CAP, plas boss (5 used)	
9	1500340M01	HOUSING, rework	
10	0300122916	SCR TPG 8-15X5/8 PHLPAN A CHS (5 used)	
11		Mounting Surface, pre-drilled for ref. #2	
<b>Non-referenced items</b>			
0180735D98		B/STN CABLE KIT contains:	
0984151B03		CONNECTOR, receptacle	
3083155H01		CABLE, 2 conductor	
0384867M01		SCR MCH M5X0.8X7 PLNHEX STL (4 used)	
1484566B01		INSULATOR, conn	
3300201M08		NAMEPLATE	
3302002A01		NAMEPLATE	
4282018H18		RETAINER, cable	
4282105N01		CLIP, speaker (2 used)	
4682540N01		BUMPER, channel	
5084401D01		SPEAKER, 2-ohm	
7582172N01		PAD, speaker (2 used)	
7583951F01		BUMPER, rubber (4 used)	

Figure 5-2  
Security Base Station  
Mounting Tray  
Exploded View and  
Parts List

69C00416M-D 90410

NOTE:

VLN5190A IS CONTAINED WITHIN VLN1156B, SECURITY BASE STATION MOUNTING TRAY.

parts list

VLN4141A SECURITY HOUSING HARDWARE KIT  
VLN5189A DVP BASE STATION SECURITY HOUSING HARDWARE KIT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	90811
P103 J106	0100886M09	ASSEM DVP SECURITY HSG CBL (refer to Figure 5-4) contains:	
	0984279D03	CONNECTOR, crimp (16 used)	
	1484277D17	HOUSING, conn	
	1484277D18	HOUSING, conn	
	2284835F01	PIN, nylon plrz	
	2884528K62	PLUG, ckt brd 10 pin	
	3010286L60	WIRE, 26 str orange 6.25 in	
	3010286L61	WIRE, 26 str yel 6.25 in	
	3010286L62	WIRE, 26 str grn 6.25 in	
	3010286L67	WIRE, 26 str blk 6.25 in	
	3010286L68	WIRE, 26 str blue 6.25 in	
	3010286L69	WIRE, 26 str vio 6.25 in	
	3010286L70	WIRE, 26 str gray 6.25 in	
	3010286M11	WIRE, 26 str red 6.25 in	
	3782633B14	GROMMET, rubber	
	4210217A02	TIE WRAP, nylon white	
1	0300135961	SCR MCH 6-32X1/4 PHLBIN STL (2)	
2	0300136784	SCR MCH 2-56X5/8 PHLPAN STL (2)	
3	0300136998	SCR MCH 4-40X1/2 PHLBIN STL (2)	
4	0300138810	SCR MCH 4-40X5/8 PHLBIN STL (2)	
5	0400002642	WASHER, lock 7/16 INT STL CAD (2)	
6	0400007650	WASHER, lock 6 INT STL CAD (2 used)	
7	0400007667	WASHER, lock 4 EXT STL CAD (6 used)	
8	0400129021	WASHER, lock 3/4 INT STL CAD (2)	
9	0782633P01	BRACKET, tray (VLN4141A only)	
10	0783083P01	BRACKET, switch	
11	3883322P01	BUTTON, sw red	
12	0980263D01	CONNECTOR, 5 pin male	
13	5580128E01	LOCK, security spdt elec	
14	1582631P01	COVER, housing back	
15	1582632P01	HOUSING, main	
16	1583080P01	HOUSING, receptacle BHDMT 2X5 pos	
17	6483082P01	PLATE, SW	
18	4082293F02	SWITCH, snap 1 A 125V (2 used)	
19	4082738P01	SWITCH, pb dpst	
20	4583081P01	CAM LOCK	
21	2900122020	LUG, solid brass HT TN	
22	2900865065	LUG	
23	3010286A12	WIRE, 16 stiv bk 8 in	
Non-referenced items			
	0984279D03	CONNECTOR, crimp (8 used)	
	2284835F01	PIN, nylon plrz	
	3010286L63	WIRE, 26 str brn/blu 7.313 in	
	3010286L73	WIRE, 26 str red/blk 7.7 in	
	3010286L76	WIRE, 26 str yel/red 5.875 in	
	3010286L81	WIRE, 26 str wht/bkt 2.75 in	
	3010286L83	WIRE, 26 str wht/org 2.75 in	
	3010286L84	WIRE, 26 str wht/yel 5.875 in	
	3010286L85	WIRE, 26 str wht/grn 4.7 in	
	3010286L86	WIRE, 26 str wht/blu 5.875 in	
	3010286L95	WIRE, 26 str grn/wht 8.25 in	
	3010286L99	WIRE, 26 str wht/vio 5 in	
	3010286M30	WIRE, 26 str red/grn 4.313 in	
	3010286M36	WIRE, 26 str org/grn 8 in	
	3383260P06	NAMEPLATE, DVP	
	3700132026	TBG HS POLYOL 3/16 CLR 0.375 in	
	3700132626	TBG HS POLYOL 3/32 CLR 0.75 in	
	4210217A02	TIE WRAP, nylon white (5 used)	

NOTE: VLN5189A IS CONTAINED WITHIN VLN1156B, SECURITY BASE STATION MOUNTING TRAY.

VLN4290A KEYLOAD LOCK

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	71204
24	5584348N03	KEYLOAD LOCK	

VLN4335A CHASSIS EXTENSION KIT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	71204
	1584663N01	CASTING, chassis exten	

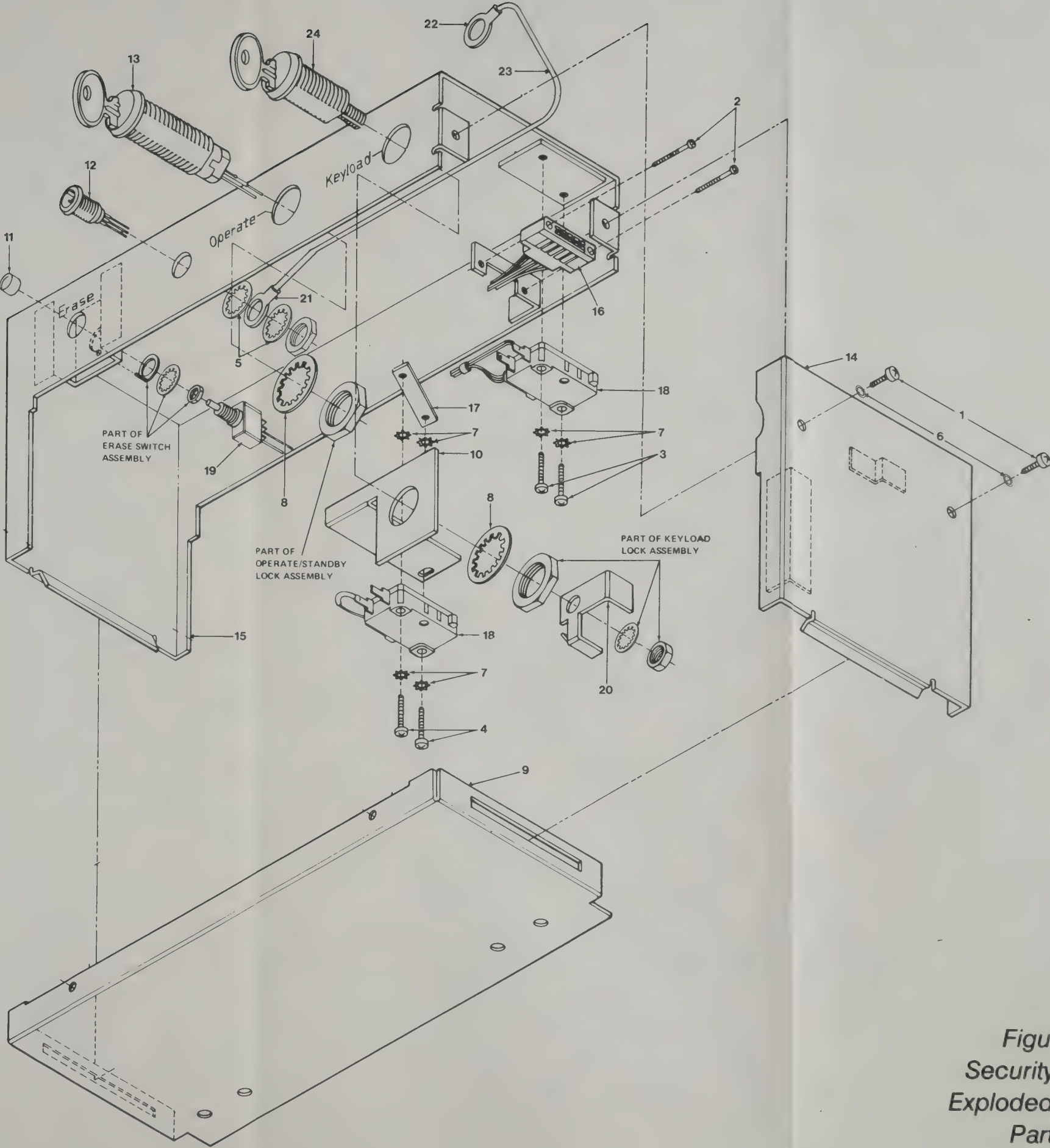
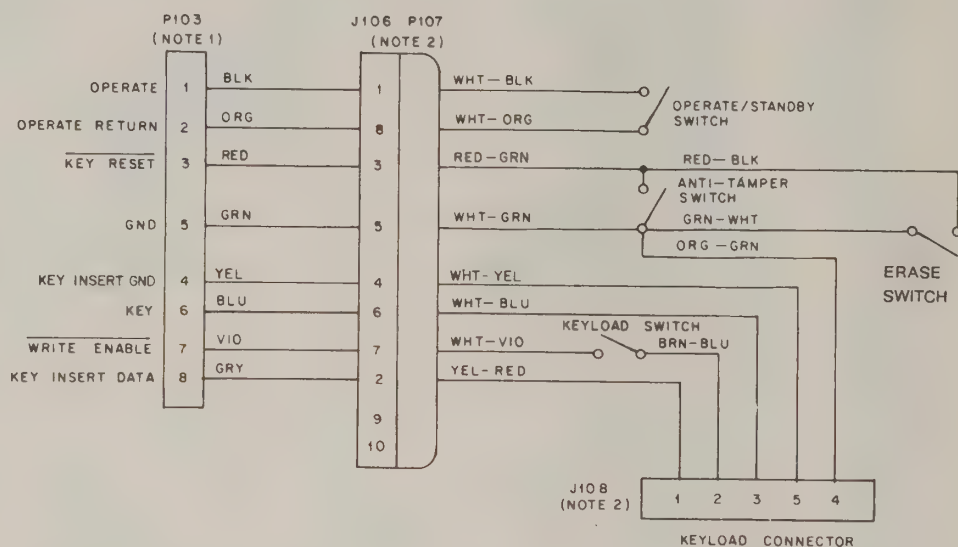


Figure 5-3  
Security Housing  
Exploded View and  
Parts List

69E00440M-O 90412





NOTES.

1. THIS CONNECTOR PLUGS INTO P6100 ON THE SECURENET OPTION BOARD
2. J106, P107 AND J108 FORM PART OF THE SECURITY HOUSING.

Figure 5-4 Security Housing Wiring Diagram





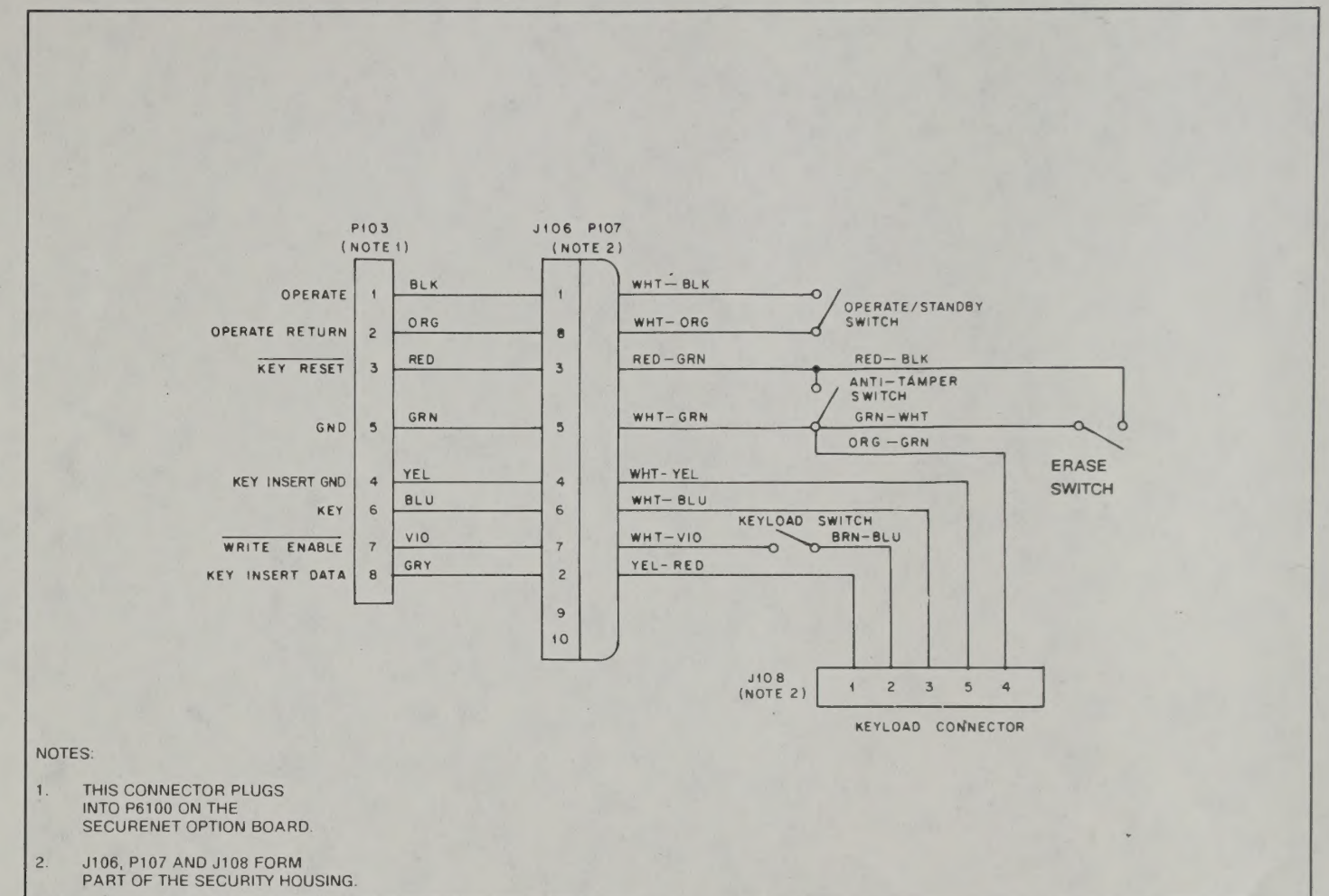


Figure 5-4 Security Housing Wiring Diagram





